Arkansas Security Alarm Association

Level I

Student Manual

Arkansas Security Alarm Association

Arkansas Level 1

00- Introduction	01-Industry Overview	02-Professionalism & Ethics	03-Building Construction	04-Safety	05-Laws, Standards & Codes
06-Electricity and Electronics	07-Micro-processors and Computers	08-Tools	09-Prepare for System Installation	10-Wireless	11-Wiring
12-Communications	13-Configure – Program	14-Testing & Trouble-shooting	15-Train Users	16-As Built Documentation	17-Maintenance & Repairs

Homework

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WELCOME

to the Arkansas Security Alarm Association's

Level 1

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Our Instructor(s)…

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Now we want to know a little about you.

- Name
- Company
- Position (Sales, Installations, Tech, etc.)
- City / State
- Years in the industry

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Introduction

Goals of this Course

- Compliance with the law
- Bring new industry members up to speed
- Broaden knowledge base
- Brush up on codes & standards

Course Overview

1. Electronic Systems Industry Overview
2. Professionalism & Ethics
3. Building Construction
4. Safety
5. Law, Standards & Codes
6. General Electricity & Electronics
7. Computers & Networking
8. Tools
9. Prepare For System Installation

Course Overview

10. Wireless
11. Wiring
12. Communications
13. Configure- Program
14. Test, Troubleshooting, Debug
15. Train Users
16. As Built Documentation
17. Maintenance & Repair
    Examination

Introduction

Basic Class Rules..Please:

- No Smoking
- Turn Pagers & Phones to silent or off
- Be prompt! - Mandatory attendance
- Don't Disturb Others - Be Quiet
- Participate

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Slide 0-7

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Why you are here.

- Improve your knowledge
- Enhance your value to your company
- Comply with state requirements

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What ASAA does for you.

- Networking
- Information
- Legislative Efforts
- Training
- Credibility & Exposure

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Introduction

We need your involvement!

- You only get back –
    what you put in

- This association is your voice to government

- Speak up!

Disclaimers

- All of the material in this course is copyrighted (2014) by ASAA
- Material may not be recorded, copied or used in any manner without the expressed written permission of the Arkansas Security Alarm Association

Disclaimers

- Specific manufacturers and products mentioned in this course are intended as examples only and are not to be construed as endorsements
- All codes declare that all manufacturers instructions must also be followed to be in compliance

Lets learn together….

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First Impressions Video

Video produced by the Alarm Association of Florida in the early 1980s to show the importance of professionalism.

Show movie.

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Electronic Systems Industry Overview

Chapter 1

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Industry Terminology

- Every industry has its own set of terms and words.
- Unsure of a term check our Glossary on the ASAA's web-site at http://www.arkansasalarm.org.

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Electronic Systems

- Burglar Alarm Systems
- Fire Alarm Systems
- Access Control Systems
- CCTV
- Home Theatre and Home Audio Systems
- Home Control and Automation Systems
- Telephone and Intercom Systems
- Computer Cabling and/or Networks
- Satellite Dish Systems

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Industry Overview

Benefits of Electronic Systems

- Security & Life Safety
  - Burglar, Fire & Panic Alarms
- Control
  - Lights, HVAC,etc
- Convenience
  - Automate Coffeemaker, Control Lights,
- Comfort
  - Adjust Heat, AC, etc
- Simplification
  - Program common steps of multiple devices from one control

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Burglar Alarm Systems

- A.K.A- Security Systems and Intrusion Detection Systems
- Consists of sensors, at least one warning device, and a control unit
- Communications capabilities may be included to alert someone off site when the alarm is activated

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Burglar Alarm Objectives

- Detect an intrusion
- Activate a warning device upon detection of an intrusion.
- Deter crime
- Protect life and property
- Bring an appropriate response to an emergency
- Enhance apprehension of Criminals

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Robbery Alarms

- A.K.A. hold-up, duress, or ambush

- Activated by inconspicuous devices.
- Silent
- Communications to alert someone off site

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Robbery Alarm Objectives

- Used to notify authorities that a hold-up is in progress

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Cameras

- Closed Circuit Television Systems (CCTV).
- Systems composing:
  - television camera
  - video monitor
  - transmission medium (Cable, fiber or wireless) connecting the two

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CCTV Camera Objectives

- Monitor the premises.
- Record Activity
- Deter crime
- Alter behavior
- To <u>NOT</u> alter behavior (covert)

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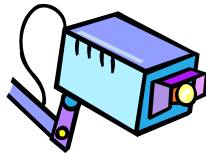
Slide 1-10

Still Cameras

- Two types
  - Continuous still cameras, also known as automatic cameras, take pictures at preset intervals
  - Sequence cameras take photos only when activated
  - Both types of cameras usually use film cartridges or SDI cards

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Slide 1-11

Still Camera Objectives

- Designed to take still photographs of an area.

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Industry Overview

Fire Alarm Systems

- Consists of
  - Initiation devices (sensors)
  - Notification Devices (at least one warning device)
  - Control unit and power supplies
  - Communications capabilities may be included to alert someone off site when the alarm is activated

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Fire Alarm Objectives

- Indicate and warn of abnormal conditions
- Provide sufficient warning to allow occupants to escape
- Summon appropriate aid
- Control facilities to control the fire
- Enhance the protection of life
- Reduce property loss and damage

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Access Control

- A system to keep unauthorized personnel from accessing (entering) or egressing (exiting) a certain building, area, office, or other secure point.

  Typically composed of a locking mechanism (mag-lock, strike, bolt) and reader (stripe, proximity, biometric) or button.

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Access Control Objectives

- Allow or deny access/egress based on possession of an certain item or physical trait.
- Track activity through a facility
- Report activity through a facility

*Access control is NOT time and attendance. Consult the Department of Labor before using access control system for time and attendance.

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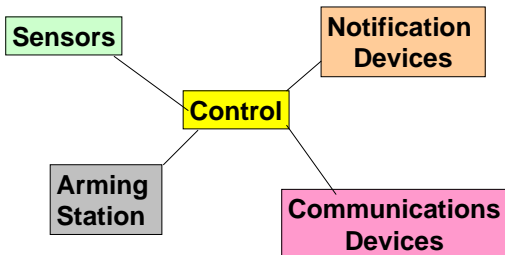**Arkansas Security Alarm Association**

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Section 1-1

Burglar Alarm Systems

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Parts to a System

Sensors

Notification Devices

Control

Arming Station

Communications Devices

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Applications of Burglary Sensors

- Point
  - Used to sense around specific objects
- Trap
  - Located in expected traffic area
- Space
  - Sense entire area or room
- Perimeter
  - Sense penetration of outer barrier of area

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Standard Contacts

- Used on doors and windows
- Switch placed on frame
- Magnet placed on door or window
- Separation generates alarm
- Available in surface or flush mount
- Different gaps available
- Built in transmitters

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Balanced Contact

- Used to prevent tampering
- Alarm caused by
  - Separation between switch and magnet
  - Addition of another magnet

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Mechanical Switch

- Used on doors, windows and cabinet doors
- Plunger held in when door or window is closed

Acoustic Glassbreak Sensor

- Listen for sound of glass breaking
- Mount on ceiling or wall
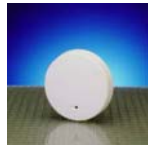
Shock Glassbreak Sensor

- Mounts on glass
- Senses vibration or shock from glass break
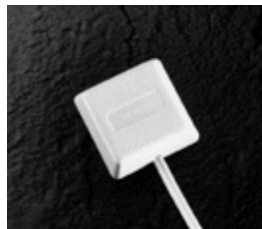
Industry Overview

Acoustic/Shock Glassbreak Sensor

- Listens for
  - Sound of glass breaking
    and
  - Shock of glass breaking
- Mount on ceiling or wall

Screens

- Existing screen or new screen is laced with wire
- One corner of screen has wire to connect to system
- Opposite corner has switch
- Magnet is mounted on frame for switch

Passive Infrared (PIR)

- Detect change in radiant heat
- People entering area change pattern
- Mount on wall or ceiling
- Patterns and ranges available
- Available with built in transmitters
- Processing of patterns determines when to indicate alarm

Industry Overview

Dual-Technology Motion

- PIR combined with Microwave
- Alarm indicated only when both trip
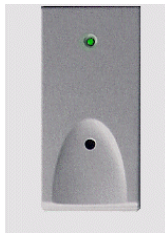

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Audio

- Microphones listen for sounds of break in
- Signal sent when type of noise is heard
- Operator listens to site to decide what is going on

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Outdated Sensors

- Foil
- Traps
- Mats
- Lacing

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Industry Overview

Outdated Motion Sensors

- Ultrasonic
- Microwave
- Infrasonic

Slide 1-31

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Section 1-2

Hold up Alarm Systems

Slide 1-32

Holdup or Panic Switches

- Button pressed to indicate an emergency
- Fixed or wireless
- Usually concealed

Slide 1-33

Industry Overview

Foot Rail- Kick bar

- Floor mounted
- Activate by foot
- Locks in place till reset

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Money Clip

- Alarm tripped when bill is removed
- Often wire to require two clips to be activated before alarm

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Section 1-3

Fire Alarm Systems

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Industry Overview

Manual Pull Stations

- **Manually activated device generally used to activate the fire alarm.**

Single Action   Double Action

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Fixed Heat Detector

- Triggered when temperature reaches preset limit
- Self restoring or single use
- Variety of temperature settings.

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Rate of Rise Heat Detector

- Triggers when temperature increases at preset rate
- Usually self restores
- Variety of temperature settings.

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Industry Overview

Combination Heat Detectors

- Triggers when temperature increases at preset rate or when temperature reaches preset limit
- Usually self restores
- Variety of temperature settings

Photoelectric Smoke Detector

- Spot Detector
  - Light projected in chamber
  - Smoke reflects light to sensor

Photoelectric

- Beam Detector
  - Smoke breaks light beam

Beam

Ionization Smoke Detector

- Air in chamber ionized to conduct current
- Smoke disrupts current flow

CO Detectors

- Detects a toxic colorless and odorless gas

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Section 1-4

Control Panels & Communication

Touchpads/keypads

- Similar to the keypad on a touch-tone telephone.
- A preset combination number is entered into the keypad to arm (turn on) and disarm (turn off) the system.
- The combination code can be changed.

Industry Overview

Keyfobs

- **Small radio transmitter, commonly located on a key chain that is used to arm and disarm the alarm system**.
- May have a panic feature.

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Keyswitches

- High security key used to arm (turn on) and disarm (turn off) the system.
- A red light is normally used to indicate if the system is armed.

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Smart Phone Apps

- Control of security system and home control via a smart phone or tablet application.

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Industry Overview

Control Panels

- Controls the system
- Activate annunciators
- Contacts the Monitoring Station
- Powers the system and devices

Slide 1-49

Wireless

- Alarm signals from small radio transmitters to a receiver

Slide 1-50

Wired Systems

- Uses wires between sensors and the control panel.

Slide 1-51

Industry Overview

Zones or Point ID

- Zones- Sensors are divided into groups by
  - Type of signal (Burglar, Fire, Holdup)
  - Type of device (Contact, Motion, etc)
  - Location (East, west, bedroom, living room, etc
- Point ID- Each Sensor is identified (addressable or polling loop)

AC Power Source

- Use a dedicated main branch when possible.
- Avoid ground fault interrupted circuits.
- Transformer should be appropriately fastened (according to code) so that it cannot be accidentally unplugged

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Backup Battery

- Include standby power for a minimum of four hours
- Replace every three years or more frequently if a site experiences a high occurrence of power outages or other environmental conditions that drain the life of the battery
- Inspect and test every year
- Battery calculations must be performed on each system to ensure adequate capacity

Digital Communicators

- Means to transmit signals to a central station,
- Uses customer's existing phone line.
  - The communicator seizes the customer's phone line and electronically dials the central -station receiver.
  - When the receiver answers, the communicator sends a message in the form of a sequence of tones.
  - A mini -computer in the receiver accepts and acknowledges the message.
  - It then prints out the information for display to the operator.

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Cellular

- The use of stationary cellular telephone equipment to replace or supplement other means of alarm signal communication between the alarm system and the monitoring facility.

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Long Range Radio

- A network of radio transmitters or transceivers capable of sending alarm status messages to one or more radio receivers or transceivers which are at, or in communication with, an alarm monitoring facility or other alarm signal receiving station.

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Industry Overview

Internet

- Uses the Internet to deliver alarm messages.
- Incorporates a very high level of encryption and two-way authentication. Internet transmitters at the alarm site send data to a compatible internet receiver at a central station over the internet.

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Types of Alarm Signals

- **Fire Alarm**
  - A signal that reports a fire, water flowing in a sprinkler system, or dangerous conditions such as smoke or overheated materials that may combust spontaneously
  - **Proper Response-** Call requesting public safety dispatch unless local AHJ allows you to make a call to verify first

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Types of Alarm Signals

- **Holdup Alarm**
  - A silent alarm signal generated by the manual activation of a device intended to signal a robbery in progress
  - **Proper Response-** Call requesting public safety dispatch, then attempt to verify the validity of the signal

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Industry Overview

Types of Alarm Signals

- **Panic Alarm**
  - An audible alarm system signal generated by the manual activation of a device intended to signal a life threatening or emergency situation requiring law enforcement response
  - **Proper Response-** Attempt to reach a responsible party at the alarm site. If that contact fails, call requesting public safety dispatch

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Types of Alarm Signals

- **Ambush or Duress Alarm**
  - A silent signal generated by the entry of a designated code into an arming station in order to signal that the alarm user is being forced to turn off the system and requires law enforcement response
  - **Proper Response-** Call requesting public safety dispatch, then attempt to verify the validity of the signal

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Types of Alarm Signals

- **Burglar Alarm**
  - Usually audible signal indicating a burglary or break in
  - **Proper Response-** Attempt to reach a responsible party at the alarm site. If that contact fails, call a different phone number, usually the cell phone of a responsible party, in an attempt to verify the validity of the alarm signal prior to requesting public safety dispatch (Enhanced Call Verification or ECV)

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Industry Overview

Other Types of Signals

- Responsible party should be contacted. Public Safety **should not** be dispatched.
  - **Trouble**- A signal indicative of a fault in a monitored circuit or component
  - **Supervisory**- A signal indicating the need for action in connection with the supervision of guard tours, the fire suppression systems or equipment, or the maintenance features of related systems

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Other Types of Signals

- Responsible party should be contacted. Public Safety **should not** be dispatched.
  - **Late to Close**- Alarm system has not been armed by the agreed upon time deadline
  - **Late to Open**- Alarm system has not been disarmed, and there is a time deadline beyond which the user wants to be sure that the premises are occupied
  - **Unexpected Openings**- Alarm system has been disarmed at a time outside the normal schedule
  - **Closing or Recent Closing**- Signal indicating that the security system has recently been armed.

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Other Types of Signals

- Responsible party should be contacted. Public Safety **should not** be dispatched.
  - **Low Battery**- Indicates when battery is almost dead
  - **AC Power Fail**- Indicates that primary AC power has failed
  - **Industrial Process Alarm**- A signal that reports off normal condition for a wide variety of commercial and industrial processes, including sump-pump operations, water levels, pressures and temperatures, chemical processes, and special furnace operations

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Industry Overview

Other Types of Signals

- Responsible party should be contacted. Public Safety **should not** be dispatched.
  - **Reset or Restoral**- Indicates that a device is restored to its original or normal condition
  - **Cancel-** Indicates that the previous alarm signal, or alarm in process, is to be disregarded.
  - **Test Signal-** Sent in an effort to confirm proper operation of the equipment
  - **Late to Test Signal**- Failure to receive an anticipated test signal at the scheduled time.

Other Types of Signals

- Responsible party should be contacted. Public Safety **should not** be dispatched.
  - **Exit Error-** A signal produced when an entry/exit zone is still violated at the expiration of the Exit Time
  - **Test Initiation Report**- At the initiation of a test, the control panel sends a message to the central station that a test is in progress
  - **Test Termination Report**- When a test is terminated, the control panel sends a message to the central station that the test is over

Monitoring Station

- Location to
  - Monitor signals
  - Analyze signals
  - Verify signals
  - Record activity
  - Request response
  - Follow-up

Industry Overview

Response

- Customer
- Alarm Company
- Guards
- Police-Sheriff
- Fire Department
- Ambulance

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Section 1-5

Notification Devices

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Horns

- Noise -making device used to indicate an alarm or other event.
- Available in 12 or 24 volt models

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Industry Overview

Strobes

- A visual indicator light with very rapid, bright flashes.
- Used to indicate an alarm or other event.
- Lens colors may vary.

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Active Graphic Annunciator

- Board or CRT screen with graphics to delineate alarm or sensor locations.
- A visual indicator showing the location of an alarm.
- Annunciators pinpoint the exact location of an alarm or problem.
- With their help, the alarm user can locate a faulted door or sensor at closing time.
- In addition, service personnel can quickly locate a system defect.

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Static Graphic Annunciator

- LEDs illuminate areas of a map of the facility to show the location of an alarm or event.
- Annunciators pinpoint the exact location of an alarm or problem.
- With their help, the alarm subscriber can locate a faulted door or sensor at closing time. In addition, service personnel can quickly locate a system defect.

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Tabular Annunciator

- LEDs illuminate a labeled area of a grid to show the location of an alarm.
- Annunciators pinpoint the exact location of an alarm or problem.
- With their help, the alarm subscriber can locate a faulted door or sensor at closing time.
- In addition, service personnel can quickly locate a system defect.

XL8 Tabular Annunciator

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Siren

- An electronic device that produces a very loud, hard to ignore sound when activated.
- Flush or surface mount.
- Self contained or a combination of speaker and siren driver.
- Continuous tone or multi-tone.

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Slide 1-77

Bell

- Electromechanical noise-making device.
- A clapper is moved electromechanically to strike the bell and produce a loud ringing sound.

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Industry Overview

Smoke Emitting Devices

- When activated, a smoke emitting device rapidly produces a dense smoke, fog or vapor that reduces the visibility in a room to a minimum.
- Smoke Emitting Devices are intended to be integrated into the premises alarm system, but may be a self-contained stand-alone unit.
- They should be manufactured specifically for this use and not adapted from other uses, such as entertainment.
- Some models allow user programming, such as delays, resets and control of volume of emission

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Section 1-6

Camera Systems (CCTV)

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Camera Types

Black and white
Color
Dome
Pan / Tilt / Zoom
Bullet
Vandal Proof
High Definition (mega-pixel)
 or NTSC

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Slide 1-81

Transmission Methods

Connecting the cameras to the recorder

Coax (RG59U, RG6U, or RJ11U)
IP based (Cat5e or Cat6)
Baluns (video over UTP –
    unshielded twisted pair)
Fiber Optics
Wireless

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Recorders

Video Cassette Recorder (VCR)

Digital Video Recorder (DVR)
    PC Based (Windows operating system)
    Imbedded (typically Linux)

Network Video Recorder

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Section 1-7

Access Control Systems

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Industry Overview

Access Control Systems

- Not regulated in Arkansas (do not need a license to install)

- Any time access control systems are installed, you must consult NFPA 72 for fire code restrictions.
  NFPA 72-21.9

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Access Control Readers

- Reads and decodes information to be processed by the access control system.

Proximity | Fingerprint | Palm Geometry | Retina Scan | Keypad

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Exit (Egress) Control Devices

- Readers (for anti-pass back or traffic flow control)
- Buttons
- Motions and mats
- Door hardware

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Locking Mechanism

- Mag-lock

- Door Strike

- Electric Locks

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Section 1-8

Other Systems

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System Integration

- Alarm system may interact with
  - Cameras
  - Access Control or door locks
  - Home Automation
  - Energy Management
  - Light control

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Professionalism & Ethics

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Professionalism & Ethics

Chapter 2

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Definitions

• **Professionalism** - the standing, practice, or methods of a professional, as distinguished from an amateur.

• **Ethics** - that branch of philosophy dealing with values relating to human conduct, with respect to the rightness and wrongness of certain actions and to the goodness and badness of the motives and ends of such actions.

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Company Standards

• **Common sources**
– Employee handbook
– Company policy
– On the Job Training

• **Common Reasons to Set Standards**
– Meet Customer Expectations
– Makes Troubleshooting easier
– It is more efficient

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Professionalism & Ethics

Company Obligations to Customer

- Meet customer need
- Comply with law
- Install full system as sold
- Test
- Ensure user understanding
- Offer ongoing service and repair

Slide 2-4

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Employee Obligations To Employer

- Do your best!
- Promote customer satisfaction
- Promote company growth
- Work as a PROFESSIONAL !!
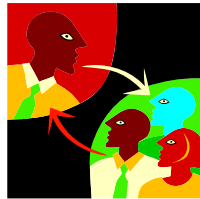
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Employee Obligations to Customer

- You only get one chance to make a first impression for YOU and YOUR COMPANY
- Look the part - dress to the level of professional that you want to be seen as
- Be Prepared - have everything you need ready to go

Slide 2-6

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Professionalism & Ethics

Courtesy

- Good customer service attracts & retains customers
- Treat the customer with respect - they are signing your check for that day !

Slide 2-7

Sales Ethics:

- Educate yourself
- Listen to your customer's needs & desires
- Design to meet the customer's need
- Inform your customer of ALL contract details
- Do not mislead a customer
- Remember - One Size Does **Not** Fit All

Slide 2-8

Installer Ethics:

- Educate yourself
- Be honest about system operation
- Comply with laws and standards
- Be safe
- Work as if it is your own home or business
- Make sure that the customer is comfortable with system operation after completion
- Make sure you leave each home or business cleaner than you found it

Slide 2-9

Professionalism & Ethics

General Obligations:

- Work WITH your local Police and Fire departments
- Promote the industry's integrity through your local and state associations
- Work within your local community and local association to promote ethics and integrity in our industry

---

Customer Communications

- Read the job documentation
- Explain what you will be installing
- Verify job specifications with customer
- Document changes

Impact of False Alarms

- Can lead to fines and suspension of public safety response
- Can endanger responders
- Reduces effectiveness of system
- Adds to cost of system

Professionalism & Ethics

False Alarm Prevention

- Proper Design
- Quality Equipment
- Proper Installation
- Proper User Education
- Verify Before Dispatch
- Follow-up on Each False Alarm

IT IS EVERYONE'S
RESPONSIBILITY TO
STOP
FALSE ALARMS

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Free Video from NESA

- The National Electronic Security Alliance has created a video, free for download, to help our customers understand the impact of false alarms.

  Download at: http://www.nesaus.org

  Play video
  Law enforcement video

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Do Your Best!

- Earn reputation as a professional
- Expand your opportunities
- Increase your value
- Gain satisfaction

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Arkansas Security Alarm Association
Arkansas Level 1

Building Construction

Chapter 3

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Slide 3-1

Construction Materials and Methods

- Wood or metal framing
- Brick, paneling, plaster or drywall
- Paint or wallpaper
- Drop ceiling, attic
- Crawl space, open or finished basement

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Slide 3-2

Construction Drawings

- **Structural Drawings**
  - Engineering of building
- **Electrical Drawings**
  - Power, lighting, alarm and communications
- **Mechanical Drawings**
  - Plumbing, heating, air conditioning

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Slide 3-3

Building Construction

Construction Documents

- **Specifications**
  – Detail description of job requirements
- **Diagrams**
  – Detailed drawings of specific projects
- **Schedules**
  – Lists of materials to be used on the job
- **Shop Drawings**
  – Detailed drawings of how a device or component will be installed

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Home Styles

Cape Cod

Colonial

Contemporary

Craftsman

European

Southern

Ranch

Victorian

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Types of Doors

Steel Entry Doors

Patio or Sliding Doors

French Doors

Wood, fiberglass or composite Entry Doors

Overhead or Garage Doors

Pet Doors

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Building Construction

Types of Windows

Sliding   Awning   Rotating   Jalousie

Fixed Pane   Casement   Double Hung   Single Hung

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Common Insulation Methods

Loose fill (Blown in)   Batt   Rigid Board

Blanket   Loose fill (Poured in)   Foamed in-place

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Proper Fasteners

Hex Bolt   Drywall Screw

Eye Bolt   Machine Screw

Flat Washer   Wood Screw

Finish Washer

Lock Washer   Self Drilling Screw

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Building Construction

Solid Material Anchors

Plastic Expansion Anchors

Leadwood Screw Anchor

Ribbed Expansion Anchors

Concrete Drop-In Anchors

Slide 3-10

Hollow Wall Anchors

Winged Plastic Anchors

Threaded Drywall Anchors

Threaded Drywall Toggles

Molly Bolts aka Sleeve Anchors

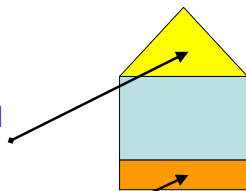Toggle Bolts

Slide 3-11

Plenum Spaces

Space used for Air Return
- Between Structural Ceiling and Drop Ceiling
- Between Structural Floor and Raised Floor

Slide 3-12

Arkansas Security Alarm Association
Arkansas Level 1

Safety

Chapter 4

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Slide 4-1

OSHA

– OSHA enforces safety standards

– Visit www.osha.gov for more information

– Standards 1926 & 1910 apply to our industry

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Slide 4-2

2001-2002 OSHA Citations

423	Electrical Wiring Methods, Components & Equipment General Use
220	Electrical, General Requirements
174	Electrical, Wiring Design & Protection
118	Fall Protection
96	Manually Propelled Mobile Ladder Stands & Scaffolds

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Slide 4-3

Safety

Job Site, Tools, Open Areas, Construction Rules, etc.

- Keep control of your tools
- Block off unsafe areas
- Clean up unsafe debris

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Slide 4-4

Install Cable Safely
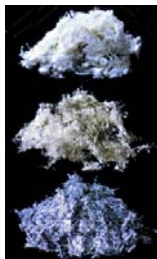
- Do not overreach on ladders
- Do not rest on drop ceiling supports
- Know what is on the other end of conduits <u>before</u> you fish
- Remove power <u>before</u> you disconnect or connect circuits

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Slide 4-5

Hazardous Environments

- Asbestos
- Crawl Space
- Gas in manholes and confined spaces

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Slide 4-6

Most Common Causes of Accidents

- Failure to communicate
  - Coordinate with fellow workers and others on each job
- Poor work habits
  - Pay attention, avoid horseplay , do not rush
- Drug or alcohol use
- Lack of skill
  - Unsure how it works – Ask for help

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Slide 4-7

Use Personal Safety Devices

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Slide 4-8

Clothing, Hair & Jewelry

- Wear proper clothing
- Keep long hair, ID badges and jewelry out of the path of drills
- Use care with metal watches, rings and jewelry around electricity

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Slide 4-9

Safety

Driver, Vehicle, etc

- Pay attention
- Focus on driving not cell phone, radio, lunch, map, etc
- Wear seatbelt
- Obey traffic laws
- Keep vehicle maintained
- Drive Defensively

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Slide 4-10

Ladder Setup

- Place ladder on a clean, slip free, level surface
- Extend the ladder 3-4 feet above the top support, if used to access roof or other elevated surface
- Anchor or secure the top of the ladder when the 3-4 foot extension is not possible
- Place the ladder base ¼ of the height of the ladder from the wall when using a straight ladder

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Slide 4-11

Safe Ladder Use

- Check shoes and rungs for slippery surfaces
- Never allow more than one person on a ladder
- Use tool belts or hand lines to carry objects
- Do not allow others to work under a ladder in use

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Slide 4-12

Safety

Ladder Safety

- Select the right ladder for the job. Use only Class II & III fiberglass ladders around electricity
- Inspect ladder before use
- Face ladder and Always hold on with one hand
- Never reach too far to either side or rear to maintain balance

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Slide 4-13

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Safe Ladder Use

- Never climb higher than second step from top on a stepladder or third from the top on a straight ladder
- Never attempt to move, shift, or extend ladder while in use
- If you have a fear of heights – don't climb a ladder

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Slide 4-14

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Electrical

- Render equipment or circuits inoperative while work is performed
- Attach tags at all points where such equipment or circuits can be energized
- Place tags to identify plainly the equipment or circuits being worked on

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Slide 4-15

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Safety

Disconnect the Power First!!!

- Turn off the breakers on any equipment you are working on
- Don't work on high voltage circuits
- Cover open circuit panel boxes.
- Verify conduits prior to running metallic fish tapes

Slide 4-16

250mA = Cardiac Arrest

- 1/4th of an Ampere with sufficient voltage to push it through you is deadly

- 120VAC is plenty sufficient!

Slide 4-17

Grounding

- NEC Article 250 describes proper grounding techniques.
- Minimum 14AWG to panel.
- Minimum 6AWG to grid (bonding)
- Should be the first wire connected in the panel
- Transients, spikes and surges have no place to go if there is no ground wire

Slide 4-18

Safety

High Voltage :>30Volts

- NEC describes high voltage as being over 30 volts
- Anything over this requires an electricians license
- Exception is communications circuits

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Slide 4-19

## CPR- Cardiopulmonary Resuscitation

- Take a CPR Class
- Make sure the scene is safe for you to help
- Make sure you have universal precautions: gloves, pocket mask, etc
- Make sure you know how many patients you have
- Determine if they are conscious by tapping and shouting "Are you OK?"
- If no response have someone call 911

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Slide 4-20

GFCI

The U S. Consumer Product Safety Commission (CPSC) recommends the use of a ground-fault circuit-interrupter (GFCI) with every power tool to protect against electrical shock hazards
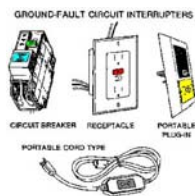
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Slide 4-21

Electric Shock

1. Remove the victim from the source of electricity before you touch him
2. If he is not breathing, begin rescue breathing immediately; a victim whose heart has stopped breathing needs CPR
3. If the person is unconscious, but is breathing and has a heartbeat, you should place him in the recovery position and monitor his breathing and heart rate until medical help arrives

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Slide 4-22

Heat

1. Cool the body of a heatstroke victim immediately
2. If possible, put him in cool water; wrap him in cool wet clothes; or sponge his skin with cool water, rubbing alcohol, ice, or cold packs
3. Once the victim's temperature drops to about 101 F, you may lay him in the recovery position in a cool room

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Slide 4-23

Heat

4. If his temperature begins to rise again, you will need to repeat the cooling process
5. If he is able to drink, you may give him some water
6. DO NOT GIVE A HEATSTROKE VICTIM ANY KIND OF MEDICATION
7. You should watch for signs of shock while waiting for medical attention

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Slide 4-24

Report All Accidents

- Report all injuries and accidents to your supervisor
- If you do not you may not be properly covered by insurance if a minor injury proves to be serious later

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Slide 4-25

Bad Idea #1

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Slide 4-26

Bad Idea #2

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Slide 4-27

Safety

Bad Idea #3

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Slide 4-28

Bad Idea #4

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Slide 4-29

Bad Idea #5

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Slide 4-30

Bad Idea #6

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Slide 4-31

Bad Idea #7

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Slide 4-32

Bad Idea #8

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Slide 4-33

5-1

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Arkansas Level 1

Law, Standards and Codes

Chapter 5

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Slide 5-1

What is a Code?

- Codes tell us when a given type system is required
- Codes are easily and often incorporated into laws
- Codes usually incorporate standards into law

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Slide 5-2

State Adopted Code

Arkansas Fire Prevention Code 2012 edition

Based on the 2012 International Building Code (IBC), International Fire Code (IFC) and the International Residential Code (IRC).

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Slide 5-3

Law, Standards & Codes

What is a Standard?

- A set of specifications or rules
- Level of quality
- Type of equipment
- Type of training
- How the system should operate

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Slide 5-4

State Referenced Standards
Relating to Fire Alarm Systems

2010 NFPA 72 –
National Fire Alarm
Code Book

2011 NFPA 70 –
National Electrical
Code

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Slide 5-5

Following Codes & Standards:

- Results in fewer false alarms
- Lower maintenance costs
- Better system performance
- More credibility!

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Slide 5-6

Law, Standards & Codes

Liability

- Substandard work leads to faulty systems
- Faulty systems lead to losses or injuries for customers
- Legal action can result affecting the industry, company and employee
- Potential for loss of license for company or employee for code / law violations
- Potential monetary damages or fines

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Slide 5-7

Judge and Jury

- Courts take into consideration whether any recognized standard was followed
- The excuse: "Everyone is doing it this way" will not win a court case!

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Slide 5-8

Where Do Standards Come From Anyway?

- Experts in the field
- Interested public
- Events (crimes, fires)
- Industry (manufacturers, insurance, owners)
- Agencies (fire, police, EMS)

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Slide 5-9

Law, Standards & Codes

Standards are updated periodically

- Most standards get updated every three years.

Slide 5-10

Types Of Standards

- International Standards
- National Standards
- State Standards
- Local Standards
- Company Standards
- Manufacturers Instructions

Slide 5-11

Which Codes And Standards Do I Use?

- Look to your local AHJ (Authority Having Jurisdiction)
- If your AHJ doesn't specify, NFPA is a pretty safe bet
- Always follow NFPA 70 (National Electric Code) for all types of systems

Slide 5-12

Law, Standards & Codes

Which Codes And Standards Do I Use?

- Many of the cities and towns adopt their own set of codes and standards.

- Arkansas Security Alarm Association has compiled a list on our web-site.

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Slide 5-13

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Who is the AHJ anyway?

- "The organization, office or individual responsible for approving equipment, installation or procedure" - *NFPA*
  - Fire Department: Chief, Fire Marshal
  - Department of Labor
  - Health Department
  - Insurers
  - Owners

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Slide 5-14

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The AHJ can approve & accept products & procedures.

- "**Approved"** indicates they will certify and support those products, applications or procedures
- "**Listed"** means that a product has met certain qualifications and testing criteria - U.L./F.M
- "**Accepted"** means that the AHJ considers it "adequate or equivalent" to satisfy a requirement or standard

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Slide 5-15

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Shall & Should…

- "**Shall**" means it is mandatory. You will do it this way
- "**Should**" means its recommended but not required. Be ready to explain to the judge and jury why you didn't

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Slide 5-16

What is this NFPA?

The National Fire Protection Association (NFPA), is an international, nonprofit, membership organization to protect people, their property and the environment from destructive fire

For more info visit www.NFPA.org

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Slide 5-17

Other Standards

- UL- Underwriters Laboratories
  (testing laboratory that also writes burglary standards)

  SIA- Security Industry Association
  (manufacturer's association that writes false alarm reduction standards)

- NFPA 731 – Standard for the Installation of Electronic Premises Security Systems

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Slide 5-18

Law, Standards & Codes

Private Investigators and Private Security Agencies Act

ASP Headquarters
1 State Police Plaza Drive
Little Rock, AR 72209

501-618-8600
http://www.asp.state.ar.us/pl/pl.html

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Slide 5-19

Company License Classes

- **Class E -Level 1:** Burglar Alarm, CCTV, Fire in Group R3- One or two family dwellings
- **Class E -Level 2:** Class E -Level 1 & Fire in Group R1 & R2 Buildings with 1 or 2 stories & Group A, less than 15K Feet & Group B except High rise & Groups F, M & S
- **Class E -Level 3:** Class E -Level 1 & unrestricted fire
- **Class E–M:** Monitoring only
- **Class E–S:** Single Station Fire in One or two family dwellings
- **Class F:** Same as Class E for company with 5 registered employees or less
- **Class F–M:** Monitoring only for company with 5 registered employees or less

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Slide 5-20

Who Is Covered?

- Alarm Systems Company
- Alarm Systems Agent
- Alarm Systems Monitor
- Alarm Systems Technician
- Alarm Systems Apprentice

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Slide 5-21

Law, Standards & Codes

Alarm Systems Company

Any person, firm, association, or corporation that for a fee or other valuable consideration <u>installs, services, sells on site, performs a survey of the premises to be protected, monitors, or responds</u> to electrical, electronic, or mechanical alarm signal devices, burglar alarms, television cameras, or still cameras used to manually or automatically signal or detect burglary, fire, breaking or entering, shoplifting, pilferage, theft, hold-up, or other illegal or unauthorized activity

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Slide 5-22

Alarm Systems Agent

Any individual employed by an alarm systems company who sells on site, performs a survey of the premises to be protected, or responds to alarm signal devices, burglar alarms, or cameras

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Slide 5-23

Alarm Systems Monitor

Any individual employed by an alarm systems company who monitors or responds

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Slide 5-24

Law, Standards & Codes

Alarm Systems Technician

Any individual employed by an alarm systems company who installs, services, or repairs on site

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Alarm Systems Apprentice

Any individual employed by an alarm systems company who installs, services, or repairs on site that is supervised by an alarm systems technician, a supervisor of technicians, or a manager

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ID Card

- Upon Termination
  – return ID card to employer within five (5)
  – notify the board in writing and pay a transfer fee prior to becoming employed with a different agency
  – employer must return card to Board within seven (7) days

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Unlawful Acts

- No licensee, or officer, director, partner, manager, or employee of a licensee, except full-time police officers, shall use a title, wear a uniform, use an insignia, use an identification, or make any statement with the intent to give the impression that he or she is connected in any way with the federal government, a state government, county government, city government, or any political subdivision of a state government.

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Slide 5-28

Unlawful Acts

- It is unlawful and punishable as provided in § 17-40-104 for any person to represent falsely that he or she is employed by a licensee.

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Slide 5-29

Possible Disciplinary Actions

- Board may revoke, suspend, reprimand, deny registration, license or renewal or fine up to $1000 for each violation

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Slide 5-30

Law, Standards & Codes

Grounds for Disciplinary Action

- Made a material misstatement in the application for or renewal of a license, registration, or security officer commission
- Violation of this act or any Board rule
- Conviction of a felony, a Class A misdemeanor, a crime involving an act of violence, or a crime involving moral turpitude
- Practiced fraud, deceit, or misrepresentation;
- Demonstrated incompetence or untrustworthiness in his or her actions.

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Slide 5-31

Penalties

- Any person who violates any provision of this chapter is guilty of a Class A misdemeanor. Any person who violates any provision of this chapter within one (1) year of a previous violation is guilty of a Class D felony.
- No person shall threaten, intimidate, or attempt to unlawfully influence any member of the Arkansas Board of Private Investigators and Private Security Agencies created by § 17-40-201 while the board member is engaged in the duties of the board. Violations of this subsection shall constitute Class A misdemeanors.

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Slide 5-32

Minimum Standards

Codes and standards contain the minimum requirements

We can exceed these minimums

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Slide 5-33

Arkansas Security Alarm Association
Arkansas Level 1

Electricity & Electronics

Chapter 6

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Slide 6-1

Types of Electricity

- **Static**
  - Lightning, Friction
- **Alternating Current (AC)**
  - Power Company - Generators
- **Direct Current (DC)**
  - Batteries, Rectified AC

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Slide 6-2

Alternating Current "A.C."

- Current moves in both directions over the same conductor
- Changes directions 60 times per second (60 cycles or hertz)
- Generated by mechanically moving conductors through North then South magnetic fields
- Can be rectified to direct current (D.C.)

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Slide 6-3

Direct Current "D.C."

• Current moves in only one direction
• Generated from a chemical reaction
• Comes from a battery or rectified A.C.

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Slide 6-4

Parts to a Circuit

• **Power Source**
  – Wall socket, generator, battery
• **Conductors**
  – Wire
• **Load**
  – Devices

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Slide 6-5

Circuits

When a circuit is closed - current will flow
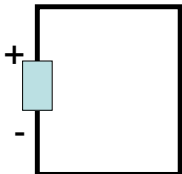
When a circuit is open - current will <u>not</u> flow

+

-

+

-
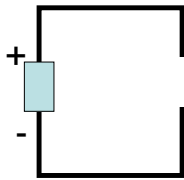
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Slide 6-6

General Electricity & Electronics
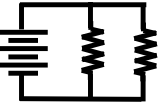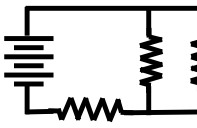
Circuit Symbols

Power Source

Resistor

Passover Without Connecting

Connection

Slide 6-7

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Types of Circuits

Series

Parallel

Series-Parallel or Combination

Slide 6-8

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Types of Circuits

Most commonly find:

Burglary circuits (zones) – Series
Robbery circuits – Parallel
Fire circuits (zones) – Parallel
Supervisory circuits – Parallel
Power (auxiliary and all other)– Parallel
Annunciation - Parallel

Slide 6-9

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General Electricity & Electronics

Measuring Electricity

- **Voltage** = Motivation –Force- Pressure
  - Measured on Volts (V)
  - Symbol in equation is "E"
- **Current** = How much
  - Measured in Amps (A)
  - Symbol in equation is "I"
- **Resistance** = Obstacles
  - Measured in Ohms (Ω)
  - Symbol in equations "R"

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Slide 6-10

Sources of Resistance

- Anything that causes electrons to slow down;
  - smaller wire
  - longer wire lengths
  - splices
  - More components

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Slide 6-11

Ohm's Law

- A mathematics equation that sums up the relationship between Resistance, Voltage and Current
- Can be used to calculate component values
- Can be used to find an unknown value. (Must know any two variables)

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Slide 6-12

General Electricity & Electronics

Ohm's Law

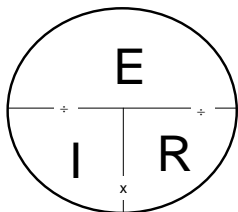- Can be mathematically manipulated to any of three formulas

  E = I x R = ?Volts
  I = E ÷ R = ?Amps
  R = E ÷ I = ?Ohms

Slide 6-13

Ohm's Law Reminder

The **E**arth **I**s **R**ound
Reminder of equations to solve for unknown

Rule of Thumb
Place thumb over unknown value

Slide 6-14

Class Exercise

In a circuit if voltage stays the same and resistance increases-

What will happen to the amperage?

Slide 6-15

Exercise Answer

Resistance increases (doubles)

E = 12V

I = 3A | R = 4Ω

E = 12V

I = ? | R = 8Ω

What happens to Amperage (I)?
Did it increase? Decrease?

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Slide 6-16

Class Exercise

In a circuit if voltage stays the same the wire shorts (resistance decreases)-

What will happen to the amperage?

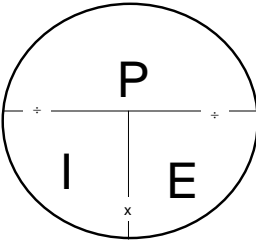ASAA – Level 1 Course © ASAA 2014

Slide 6-17

Power = Watts = VA

- Is a value of the actual "work" being done by the electricity
- Is found by multiplying Volts times Amps (thus the VA)
- Is measured in Watts
- Symbol is "P","W" or "VA"

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Slide 6-18

General Electricity & Electronics

Power Wheel

The same "Rule of Thumb" will work with Power.

Slide 6-19

Units of Measurement

- Micro (μ) - One millionth- 0.000001
- Milli (m) - One thousandth- 0.001
- Kilo (K) - One thousand- 1000
- Mega (M) - One million- 1,000,000
- Giga (G) - One billion- 1,000,000,000
- Tera (T) - one trillion- 1,000,000,000,000

Slide 6-20

Conversions

To convert from a "prefix" to a base unit, multiply by the value related to that prefix on the previous slide.

To convert from a base unit to a prefix, divide by the value related to that prefix on the previous slide.

Slide 6-21

Class Exercise

How do you convert from the milliamp scale to the amp scale?

Slide 6-22

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Exercise Answer

We are converting from a prefix to a base unit. We will multiply the amount by the value related to the prefix.

Answer: We would multiply by 0.001

Slide 6-23

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Class Exercise

How do you convert from the volts scale to the millivolts scale?

Slide 6-24

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General Electricity & Electronics

Exercise Answer

We are converting from a base unit to a prefix. We will divide the amount by the value related to the prefix.

Answer: We would divide by 0.001

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Class Exercise

How do you convert from the ohms scale to the kilo-ohm scale?

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Exercise Answer

We are converting from a base unit to a prefix. We will divide the amount by the value related to the prefix.

Answer: We would divide by 1,000

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General Electricity & Electronics

EMI- Electro Magnetic Interference

- A disturbance that interrupts, obstructs, or otherwise degrades or limits performance
- Electrical interference may be caused by power lines or electrical equipment
- Can mask data signals on cabling and telephone lines

Induction

- When magnetic flux lines cross into another conductor, current flow is generated within the separate conductor
- Effect is maximized by longer parallel conductors - more surface area
- Effect in minimized by crossing conductors at ninety degree angles - less surface area

RFI- Radio Frequency Interference

- Signals from amateur radios, CBs, and radio and television stations
- Can interfere with data transmissions
- Can Block Radio signals

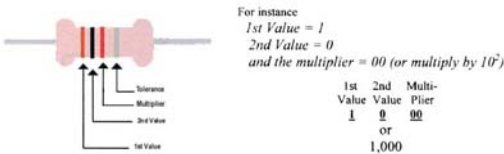# General Electricity & Electronics

Resistor

- Provides a specific amount of resistance
- Used to Control Current
- Resistor values can be determined
  - by using an Ohm-meter or
  - by reading the color bands.

Read the Resistor Color Code

Begin with the band closest to the end of the resistor (1st Value); this is the first digit of the resistance. In the example, the first band is brown and the color table lists brown as "**1**", so our first digit = **1**. The second band is black, so it equals **0**. The final band is the multiplier which is red. That makes the multiplier "**10²**" or "**00**". The resistor value would be **1.000 (1K) Ohms**.

For instance
1st Value = 1
2nd Value = 0
and the multiplier = 00 (or multiply by 10²)

	1st Value	2nd Value	Multi-Plier
	1	0	00
		or	
		1,000	

Tolerance Band: brown 1%, red 2%, gold 5%, silver 10%, no color 20%,

Color code

Color	#	Multiplier	X	Color	#	Multiplier	X
Black	0	X	1	Green	5	X00,000	10⁵
Brown	1	X0	10	Blue	6	X000,000	10⁶
Red	2	X00	10²	Violet	7	X0,000,000	10⁷
Orange	3	X000	10³	Gray	8	X00,000,000	10⁸
Yellow	4	X0,000	10⁴	White	9	X,000,000,000	10⁹

Tolerance Band gold 5% silver 10% no color 20%

Tolerance

• Tolerance band is located by itself at the opposite end of the resistor.
• Gives us variation that this particular resistor provides.
• A sliver band resistor could vary from 900 to 1100 Ohms for example).

Tolerance
Multiplier
2nd Value
1st Value

Multiplier
2nd Value
1st Value

Tolerance Band: brown 1%, red 2%, gold 5%, silver 10%, no color 20%,

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Slide 6-34

Resistors Quiz

Let's try some examples:

R_1

Gold
Brown
Brown
Brown

In the Resistor R_1 above fill in the blanks for the 1st value, 2nd value, multiplier and tolerance.

1	1	0	5 %
1st Value	2nd Value	Multi-plier	Toler-ance

What is the labeled resistor value?

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Slide 6-35

Resistors Quiz

R_6

Gold
Gray
Black
Brown

What is the labeled resistor value?

What is the range (tolerance) of the resistor?

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Slide 6-36

Resistors Quiz

R₉ — Silver

— Black
— Green
Yellow

What is the labeled resistor value?

What is the range (tolerance) of the resistor?

Slide 6-37

Capacitors

• Blocks the flow of D.C. while allowing A.C. to pass
  – Can be used as filters
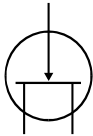 – Can store an electrical charge

Slide 6-38

Diode (a Semiconductor)

– Equivalent to an electron "check valve"
– Allows current to flow in only one direction
– Can be used to rectify (convert) A.C. to D.C.

Slide 6-39

General Electricity & Electronics

Transistor (a Semiconductor)

–Can be used as an electrical switch
–Can be used to amplify a signal

Relay

• Is an electro-mechanical switch
• Can be used to electrically isolate circuits
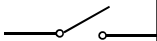• Coil is rated at a certain voltage
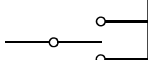• Contacts are rated at a certain amperage

Switches

• Used to Make and Break a circuit

Single Pole Single Throw (SPST)

Single Pole Double Throw (SPDT)

Double Pole Double Throw (DPDT)
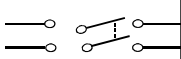
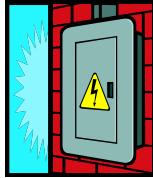## Fuses and Circuit Breakers

- Interrupts circuit when amperage goes over a certain level
- Protects wiring and devices

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Slide 6-43

Surge Protection

- Transorbs / Gas Tube / MOV's
- Arrest voltage spikes
- Are rated in volts and joules (similar to Watts)
- Shunt surges and spikes to ground
- MUST HAVE A GROUND TO WORK!

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Slide 6-44

Transformers

- Used to Reduce or Increase AC Voltage
- Rated by
  - Incoming Voltage
  - Output Voltage
  - Amperage or VA

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Slide 6-45

Class Exercise

If a transformer is bad-
Can you replace it with:
A different voltage?
A higher VA rating?

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Slide 6-46

Standby Battery Calculation

• **NFPA 72 requires 24 hours* of standby battery on all fire systems. It also requires at least 5 minutes power to all devices in alarm condition after the 24 hours of no power (4 minutes for residential, 15 minutes for voice evacuation).**

*NFPA 72, 1999 edition and older require 60 hours of standby battery for remote station alarms.

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Slide 6-47

Battery Calculation

Requirement – Per NFPA 72, National Fire Alarm Code, we must provide 24 hours of standby battery and then sound the alarm for 5 minutes.

Device	Quantity	Standby Each	Alarm Each	Total
Control	1	150mA	220mA	
Keypad	1	75mA	120mA	
Motion Detector	2	35mA	75mA	
Smoke Detector	2	45mA	120mA	
Siren	1	-	650mA	
Total				

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Slide 6-48

General Electricity & Electronics

Battery Calculation
Convert all values to base unit (Amps)

Device	Quantity	Standby Each	Alarm Each	Total Standby/Alarm
Control	1	150mA		**.15A**
Keypad	1	75mA		**.075A**
Motion Detector	2	35mA		**.07A**
Smoke Detector	2	45mA		**.09A**
Siren	1	-		**- /**
			Standby / Non-Alarm	**.385A**

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Slide 6-49

Battery Calculation
Convert all values to base unit (Amps)

Device	Quantity	Standby Each	Alarm Each	Total Standby/Alarm
Control	1		220mA	**.22A**
Keypad	1		120mA	**.12A**
Motion Detector	2		75mA	**.15A**
Smoke Detector	2		120mA	**.24A**
Siren	1		650mA	**.65A**
			Alarm	**1.38A**

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Slide 6-50

Battery Calculation

Requirement – Per NFPA 72, National Fire Alarm Code, we must provide 24 hours of standby battery and then sound the alarm for 5 minutes.

Total Non-Alarm Current	.385A	X	24	9.24 Ah
Total Alarm Current	1.38A	X	.08333	.115 Ah
Standby and Alarm	9.24 Ah	+	.115 Ah	9.355 Ah
Total Required Amp Hours	9.355 Ah	X	1.2 De-rating factor	11.226 Ah

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Slide 6-51

Electricity Video

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Slide 6-52

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Tolerance

- Tolerance band is located by itself at the opposite end of the resistor.
- Gives us variation that this particular resistor provides.
- A sliver band resistor could vary from 900 to 1100 Ohms for example).
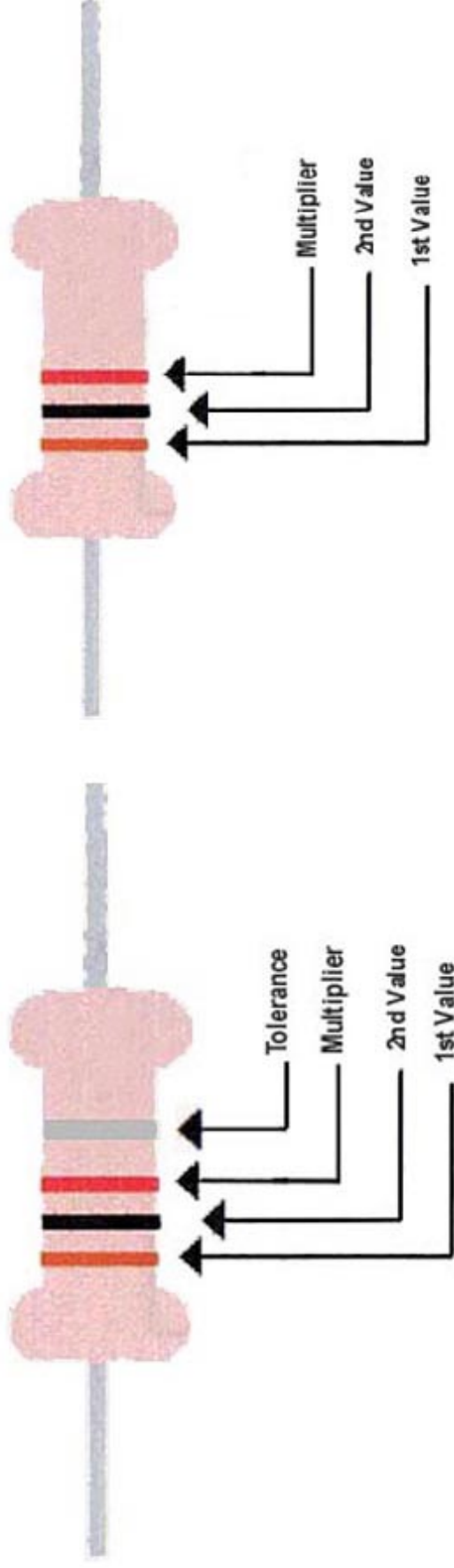
Tolerance Band: brown 1%, red 2%, gold 5%, silver 10%, no color 20%,

Computers & Networking
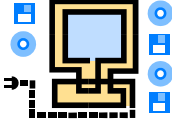
Computer Uses

– Control equipment
– Remote programming
– Sensor enhancement

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Slide 7-2

Network Uses

• Monitoring over the Internet
• Central Station Monitoring
• Interconnect to other systems

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Slide 7-3

Computers & Networking

Benefits

- Cross reference information
  - Allows operators to see information based on signal
  - Allow sensors to analyze signal vs. environment
- Expands options- Flexibility
  - Ability to program options for different situations

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Benefits

- Provides more information
  - logs
  - activity records
  - operator directions for each zone or site
- Reduces human error
  - Displaying appropriate information reduces error
  - Routine tasks can be automated

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Benefits

- Filter information
  - Only required info is shown
- Speeds response
  - Communication improved
  - Less time spent finding procedures
- Increases efficiency

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Disadvantages

- Complexity can add to troubleshooting time
- Requires increased training to diagnose or repair programs

Slide 7-7

Surge Protection

- Computer equipment should be protected from
  - **Spikes** - a momentary sharp increase and fall in electric voltage or current
  - **Surges-** to rise suddenly to an excessive or abnormal value

Slide 7-8

UPS – Uninterruptible Power Supply

- Because computers store some items in RAM or temporary memory that will be lost if power is lost
- Continuous power is important
- Use battery backup and/or UPS systems

Slide 7-9

Computers & Networking

LAN- Local Area Network

Local Area Network

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Slide 7-10

WAN- Wide Area Network

Site A
(NW AR)

Site B
(Little Rock)

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Slide 7-11

The Internet

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Slide 7-12

Computers & Networking

Internet Backbone

U.S. Map of the Internet

Slide 7-13

DSL

- **Digital Subscriber Line** provides digital data transmission over the wires used in the "last mile" of a local telephone network.
- Download speed ranges from 128 kilobits per second (Kbps) to 24,000 Kbps

Slide 7-14

Cable Modem

- Modulates a data signal over cable television infrastructure.
- Cable modems are primarily used to deliver broadband Internet access, taking advantage of unused bandwidth on a cable television network.
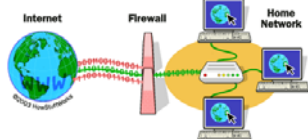
Slide 7-15

Router vs Switch

- Router acts as a junction between two networks to transfer data packets among them.
- Switch that connects devices to form a Local Area Network (LAN).

- *Router is the intersection to connect to a street- Switch is the street – each house has a fixed address*

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Slide 7-16

Firewall

- Program or hardware device that filters the information coming through the Internet connection into your private network or computer system.
- If an incoming packet of information is flagged by the filters, it is not allowed through.

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Slide 7-17

Firewall Methods

- Firewalls use one or more of three methods to control traffic flowing in and out of the network:
    - **Packet filtering** - Packets (small chunks of data) are analyzed against a set of **filters**. Packets that make it through the filters are sent to the requesting system and all others are discarded.
    - **Proxy service** - Information from the Internet is retrieved by the firewall and then sent to the requesting system and vice versa.
    - **Stateful inspection** - Compares certain key parts of the packet to a database of trusted information. Information traveling from inside the firewall to the outside is monitored for specific defining characteristics, then incoming information is compared to these characteristics. If the comparison yields a reasonable match, the information is allowed through. Otherwise it is discarded.

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Slide 7-18

Computers & Networking

Firewalls Can Block

- Specific IP Address- e.g.:216.27.61.137
- Specific Domain Name e.g.: www.alarm.org
- Specific Protocols- e.g.: http, ip, smtp
- Specific Port numbers- e.g.: 80, 21
- Specific Words

Getting thru the Firewall

- Add your IP Address, Domain Name, Protocols, Port numbers or Words to the approved list
- Or Remove it from the bad list

- List may be at the firewall or on the internet or both

Internet Service Provider (ISP)

- Business or organization that offers users access to the Internet and related services.
- Provide services such as Internet transit, domain name registration and hosting, dial-up access, leased line access and colocation.
- Internet hosting services run servers, provide managed hosting, and include the Internet connection.

Computers & Networking

IP Address

- **I**nternet **P**rotocol address
- A unique number that devices use in order to identify and communicate with each other on a network
- Used to route messages.

Slide 7-22

IP Address Format

- 32-bit numeric address written as four numbers separated by periods.
- Each number can be zero to 255.
- Example, 67.160.10.240.

- *Think of it as your street address or internet telephone number*

Slide 7-23

Assigning IP Addresses

- On an isolated network
  - you can assign IP addresses at random as long as each one is unique.
- Connecting to the Internet
  - requires using registered IP addresses to avoid duplicates.

- *Street address registered with Post Office so you get mail*

Slide 7-24

Computers & Networking

Subnet

- Allows you to break down a single large network into smaller ones.
- Allows a single site to have a number of local area networks.

- *Like an apartment building with single address, but several apartment numbers or a phone system with extensions*

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Slide 7-25

Static or Dynamic Address

- Static
  – Address is assigned and remains until changed
- Dynamic
  – Address is assigned each time the computer or modem connects

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Slide 7-26

DHCP

- Dynamic Host Configuration Protocol
  – Lets network administrators centrally manage and automate the assignment of Internet Protocol (IP) addresses in an organization's network.
  – A unique IP address, which is assigned when an Internet connection is created for a specific computer.

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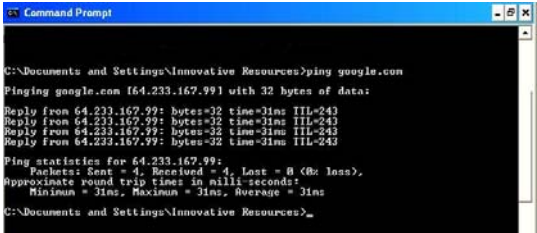Slide 7-27

Computers & Networking

Ports

- Any server machine makes its services available to the Internet using numbered **ports**, one for each service that is available on the server.
- Clients connect to a service at a specific IP address and on a specific port.

- Common Port Numbers
- echo 7
- daytime 13
- qotd 17 (Quote of the Day)
- ftp 21
- telnet 23
- smtp 25 (Simple Mail Transfer, meaning e-mail)
- time 37
- nameserver 53
- nicname 43 (Who Is)
- gopher 70
- finger 79
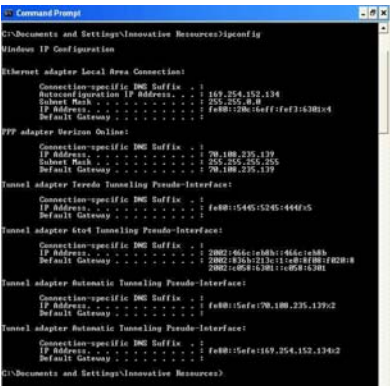- WWW 80

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Slide 7-28

Ping

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Slide 7-29

Ipconfig

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Slide 7-30

Computers & Networking

Potential Internet Issues

- Unregulated
- No requirements for backup power
- Volume of traffic can delay or prevent data
- Multiple Service Providers involved in each communication –
  - Sender modem
  - Sender path
  - Sender ISP
  - Backbone
  - Recipient ISP
  - Recipient Path
  - Recipient Modem

VoIP

- POTS connect directly to Telco
- Telco provides backup Power
- VoIP equipment needs its own backup
- Lost or delayed packets are not noticed for voice, but a problem for data
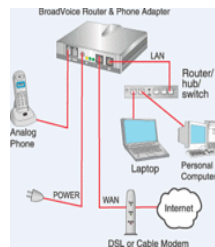
Tools

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Tools

Chapter 8

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Slide 8-1

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Quality

- Get the best quality you can afford
- Unreliable tools cost you time and money and can lead to damage to equipment and property
- Use tools for the intended purpose

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Slide 8-2

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Safety

- Know how each tool works
- Be aware of potential hazards
- Wear appropriate safety gear

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Slide 8-3

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Tools

Hand Tools

- Keep tools clean
- Discard if handles are splintered, chipped or broken
- Use the correct size
- When twisting, prying or swinging make sure the path is clear
- Sharpen cutting edges
- Oil hinges and moving parts

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Slide 8-4

Power Drills

- Use the correct bit
- Use a sharp bit
- Tighten the chuck
- Let the drill do the work
- Avoid pressure
- Use both hands

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Slide 8-5

Fish Tapes

- Use fiberglass tapes when possible
- Know what is on the other end
- Pull a pull line first for multiple bends or cables
- Use gloves or grip tools when pulling the tape back to you

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Slide 8-6

Tools

Pull Rods

- Use fiberglass rods when possible
- Know what is on the other end

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Slide 8-7

Connection Tools

- Discard worn blades on punch tools
- Insulate metal blades when working on live lines
- Let the tool do the work do not use excess pressure

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Slide 8-8

Staple Gun

- Useful to fasten cable
- Avoid tight fit around cable

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Slide 8-9

Tools

Digital vs. Analog Meters

- Digital is much more durable and forgiving
- Analog is best for detecting "swingers"

Slide 8-10

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Test Equipment

- Set to measure what you want to measure, volts, amps, ohms
- Check the range setting to make sure you will not exceed it
- Power down when not in use

Slide 8-11

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Phone Test Equipment

Modular phone line splitter

Lineman's test set

Slide 8-12

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Tools

Level

- Level is straight horizontally
- Plumb is straight vertically
- Dropping a level may move it out of alignment

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Slide 8-13

Stud Finder

- Helpful to locate studs in side walls

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Slide 8-14

Soldering/Desoldering Techniques

- Only use rosin core solder
- Keep the tip of the soldering iron or gun clean and tinned
- Clean the parts to be soldered

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Slide 8-15

Tools

Soldering/Desoldering Techniques

- Start with a strong mechanical joint.
- Use a properly sized soldering iron or gun
- Heat the parts to be soldered, not the solder

Soldering/Desoldering Techniques

- Use only enough solder to fill all voids
- Keep everything absolutely still for the few seconds
- A good solder connection will be quite shiny - not dull gray or granular

Class Exercise

What are some other tools that you commonly use to install systems?

Prepare For System Installation

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Prepare for System Installation

Chapter 9

Preparation Steps

- Conduct site survey
- Documentation
- Finalize sensors
- Select and locate control
- Select wiring paths
- Develop a job plan
- Preassemble
- Pretest

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Section 9-1

Conduct Site Survey

Prepare For System Installation

Burglary System Survey

- Are customers worried about detection while at the location, or away?
  (Motion detectors are usually disarmed while in stay mode)

- Are doors "tight" enough for magnetic contacts?

- Are windows moveable, fixed, or a mix of both?

- Will there be partitions/areas?

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Slide 9-4

Fire System Survey

- Who is the AHJ on this project?
- What fire code has been adopted?
- Are their requirements beyond existing local and state fire codes? (insurance?)
- What occupancy classification?
- Is the building sprinkled?
- What if there are existing devices? (electrician installed smoke detectors)

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Slide 9-5

Access Control System Survey

- How many doors?
- How many users?
- What type of doors?
  - Are the doors sturdy?
  - Do they swing in or out?
- What type of computer resources will be available to administer the system?

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Slide 9-6

Prepare For System Installation

Camera System Survey

- How much light?
- How many cameras?
- How much archival information?
- How many frames/fields per second?
- Will there be remote access?
- What type of networking / IT resources are there?

Keep it Simple

- Over complicated systems can lead to:
  - False Alarms
  - Service calls to explain operation
  - Dissatisfied customers

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Section 9-2

Documentation

Prepare For System Installation

Disclaimer

- The forms used in this course are used for examples
- Significant legal language or items specific to you company requirements may not be included

Slide 9-10

Contract or Agreement

- Full agreement on job requirements
- Legal language

Slide 9-11

Work Order

Lists specific types of equipment and locations

Slide 9-12

Prepare For System Installation

Change Order

Makes a change to a contract for a new system

Or

Makes a change to an existing system

Slide 9-13

Parts List

Lists ALL the required parts

Slide 9-14

Use Job Documentation to:

- Verify that equipment is appropriate
- Select locations
- Determine wiring requirements
- Select wiring paths

Slide 9-15

Prepare For System Installation

Verify That Equipment Is Appropriate

- Is it possible to get wire between the control and all the devices?
- Will metal used in construction interfere with transmissions between devices?
- Does air flow, size, window placement, etc. rule out some types of sensors?

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Slide 9-16

Check Construction

- Drywall, Plaster, Brick, Cinderblock
- Drop ceiling, attics, crawlspaces, unfinished basements
- Check if closets on each level line up
- Look for a utility room
- Hardwood floors or carpeting
- Can molding be removed?

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Slide 9-17

How To Find The Construction Type

- Tap on the walls to see if they are hollow
- Remove a switch or outlet plate to see what is behind it
- Check the attic, basement or crawl space
- Ask the site owner

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Slide 9-18

Prepare For System Installation

Double Check

- Make sure that the system will work for the customer
- Do they have pets?
- Are all areas of concern covered?
- Can they live with the design?

Slide 9-19

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Class Exercise

What are some reasons that you changed a system design from what was on the documentation?

Slide 9-20

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Class Exercise

How did you handle making the change?

Slide 9-21

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Prepare For System Installation

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Section 9-3

Finalize sensors

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Slide 9-22

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Section 9-3

Finalize sensors
Motion Detectors

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Slide 9-23

Sensor Considerations

- Check the manuals for:
  - Coverage pattern of each sensor
  - Mounting requirements
  - Environmental requirements
  - Recommended locations

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Slide 9-24

Prepare For System Installation

Sensor Location Considerations

- Exposure to direct solar radiation
- Exposure to natural drafts or artificial ventilation
- Likelihood of vibration induced by wind, traffic, pumps, etc.
- Types of surfaces, finishes and their ability to absorb and reflect

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Slide 9-25

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Sensor Location Considerations

- Positioning to ensure proper operation (maximum coverage, minimal blockage)
- Proximity of radiant or convective heating appliances
- Proximity of air supply diffuser vents or air extract grills
- Possibility of normal human activity impacting the sensor

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Slide 9-26

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Class Exercise

What are some common mistakes when locating Passive Infrared (PIR) sensors?

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Slide 9-27

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Prepare For System Installation

PIR Location Considerations

- Avoid heating devices that will cause rapid temperature increase
- Avoid applications where the sensor pattern cannot terminate on a flat surface
- Avoid areas that will frequently be occupied by people or animals while system is armed

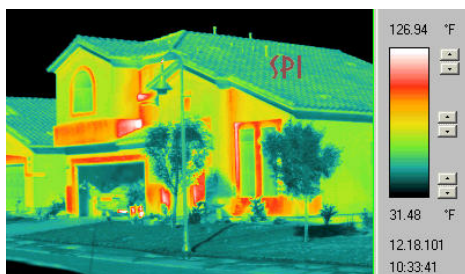ASAA – Level 1 Course © ASAA 2014

Slide 9-28

PIR Location Considerations

- Mount on a stable wall or ceiling to avoid alarms caused by vibration
- Avoid directing at a window, heat source or reflected heat source
- PIRs react to "crosswalk", not walking toward and away from the unit.

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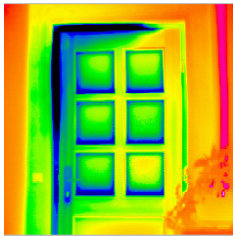
Slide 9-29

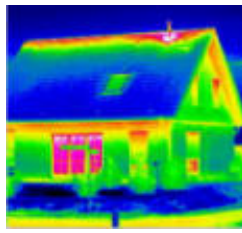## Infrared Image of a Home

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Slide 9-30

Prepare For System Installation

Infrared Image of a Home

Inside A Front Door

Outside A Home

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Slide 9-31

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Possible Problems
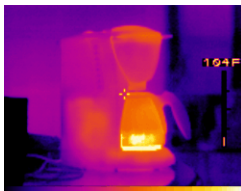
A Coffee Maker

A Plug in Air Freshener

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Slide 9-32

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Possible Problems
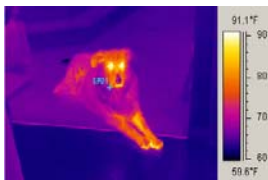
A Dog

A Cat

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Slide 9-33

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Prepare For System Installation

Possible Problems
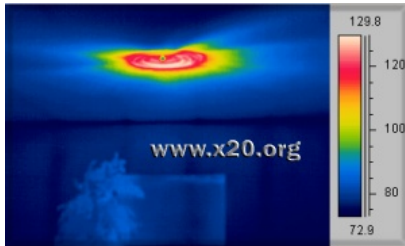
A Vent

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Slide 9-34

The Objective

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Slide 9-35

Dual Tech Motion Detectors

- Typically passive infrared and microwave technologies.
- Both must trip before alarm
- Used to reduce false alarms
- Less sensitive because movement must cross motion patter (PIR) and move toward and away from unit (microwave).

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Slide 9-36

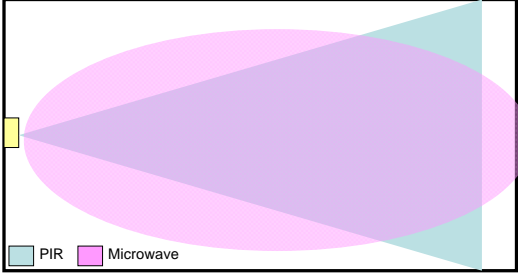# Prepare For System Installation

Dual Tech Motion Detectors
Overhead view of patterns

PIR   Microwave

Slide 9-37

Testing Motion Detectors

- Follow manufacturer's instructions
- Enable the walk test light
- Walk through premises, should not be able to take more than four (4) steps in the detection area without being "seen" or "caught" by the sensor
- Test as though a burglar
  Crawl?   Kneel?
- Make sure that device trips control and sends signal to the monitoring station

Slide 9-38

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Section 9-3

Finalize sensors
Door Contacts

Slide 9-39

Prepare For System Installation

Contact Location Considerations

- Conceal contact if possible
- Conceal or protect wiring
- Check manufacturers instructions
- Ease of wiring
- Ease of mounting
- Detection ability
- Exposure to environment
  - Easier to service
  - Exposed to accidental damage

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Slide 9-40

Contact Location Considerations

- Poorly fitting doors or windows and improper installation are the primary causes of false alarms.
- Extreme weather conditions which cause excessive movement of the door, window or access portal can cause a false alarm.
- Preferred mounting location is 12" or more from the frame toward the center of the door.

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Slide 9-41

Contact Location Considerations

- Surface reed switches should be installed parallel to the magnet.
- "Wide gap" designation usually means a higher quality reed switch and a more powerful magnet.
- Installation of the reed in parallel to the magnet is preferred.
- Proper alignment and spacing from metallic materials is required.

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Prepare For System Installation

Surface or Recess

- Surface -Mounting on top of a surface
  - Faster
- Recess- Mounting in a hole drilled into a surface so that the object is flush with the top of the mounting surface
  - Neater
  - More secure

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Slide 9-43

Testing Door Contacts

- Follow manufacturer's instructions
- Close door, make sure zone is clear on touchpad
- Open door, make sure zone shows open on touchpad
- Make sure that you cannot open the door far enough to access without the sensor opens
- Make sure that device trips control and sends signal to the monitoring station

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Section 9-3

Finalize sensors Glassbreak Detectors

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Acoustic Glassbreak Locations

- The acoustical characteristics of the room in conflict with the sensor's performance specifications
- "Soft" acoustic rooms (e.g. carpeted with window drapery) that absorb vibration or by altering the acoustic characteristics of the "hard" room (e.g., adding window shutters, blinds, draperies, rugs) after the sensor has been tuned can cause detection inadequacy of the sensor
- Proper placement calibration and testing are required to avoid false alarms

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Testing Glassbreak Detectors

- Follow manufacturer's instructions
- Use manufacturer's test device (simulates the sound of breaking glass)
- Make sure to test from each window that the detector is expected to trip. Make sure that curtains, blinds, and other window coverings are in their normal position when testing.
- Make sure that device trips control and sends signal to the monitoring station

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Section 9-3

Finalize sensors
Outdoor Sensors

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Prepare For System Installation

Considerations for Outdoor Sensors

- Presence of grass or vegetation
- Possibility of leaf accumulation
- Possibility of movement of branches
- Likelihood of snow accumulation
- Possibility of fog, mist or dust.
- Occurrence of lightning.
- Check manufacturer's recommendations

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Slide 9-49

Testing Outdoor Sensors

- Follow manufacturer's instructions
- Make sure that device trips control and sends signal to the monitoring station

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Slide 9-50

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Section 9-3

Finalize sensors
Fire Sensors

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Slide 9-51

Prepare For System Installation

The Fire Threat - 2010

- 2640 Civilian Fire Deaths in US Homes
- Every 24 Seconds a fire department responds to a fire somewhere in the US
- Residential Fire occurs every 82 seconds
- $11.6 Billion in Property Loss

Source NFPA

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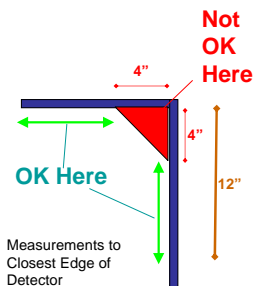
Slide 9-52

Smoke Detector Locations

- One outside each sleeping area
- One on each full level
- In new construction, smoke alarms are also required in every sleeping room
- Ceiling mounted detectors shall be at least 4 inches from adjoining wall
- Wall mounted detectors shall be between 4 to 12 inches below the ceiling

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Slide 9-53

Spot-Type Smoke Detector Locations

- On the ceiling not less than 4 in. from a sidewall to the near edge or, if
- On a sidewall, no portion within 4 in. of the ceiling and at least some portion at or above 12 in. down from the ceiling to the top of the detector.

Not OK Here

4"

4"

OK Here

12"

Measurements to Closest Edge of Detector

Text- NFPA 72-5.7.3.2.1
Figure- NFPA-72-A.5.6.3.1

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Prepare For System Installation
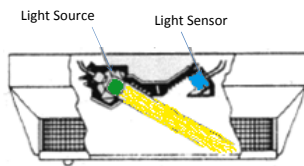
Smoke Detector Locations

- Not in kitchens, garages, spaces where temp may fall below 40° or above 100°
- No closer than 3 ft from:
  - Door to kitchen
  - Door to bathroom with tub or shower
  - Supply register

Slide 9-55

Photoelectric Smoke Detector Normal Situation

- Pulsed Light sent into Chamber
- Normally avoids Sensor

Light Source   Light Sensor
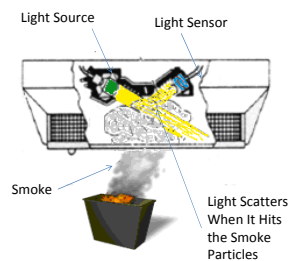
Slide 9-56

Photoelectric Smoke Detector

- Smoke reflects light into the source
- Causes Alarm

Light Source   Light Sensor

Smoke

Light Scatters When It Hits the Smoke Particles

Slide 9-57

Prepare For System Installation
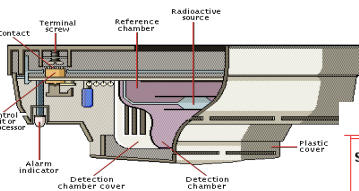
Ionization Smoke Detector

- Air in chamber ionized to conduct current
- Smoke disrupts current flow

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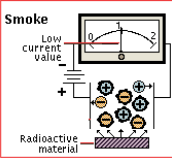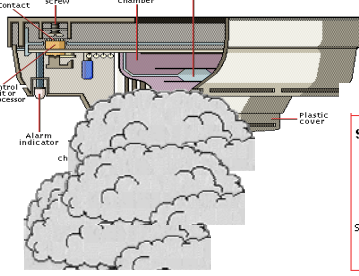## Ionization Smoke Detector Normal Situation

Current Flows

Current Flows Thru Chamber

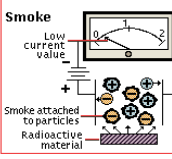ASAA – Level 1 Course © ASAA 2014

Slide 9-59

Ionization Smoke Detector Normal Situation- Alarm

Current Blocked

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Slide 9-60

Prepare For System Installation

Ionization Smoke Detector
Dual Chamber Detector

- Reference chamber added to adapt to environment and reduce false alarms

REFERENCE CHAMBER   SENSING CHAMBER

TINY HOLE OPENINGS   LARGE HOLE OPENINGS

Ammeter   Ammeter
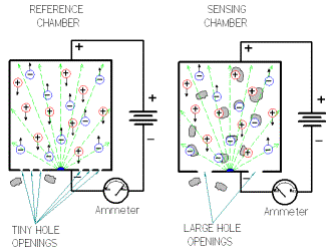
Heat Detector Locations

- Where smokes are not appropriate

Fire Notification Appliances

- Clearly audible over background noise with all intervening doors closed (75db at the pillow)
- New construction- Activating one detector shall cause alarm to sound in all detectors
- If household has one hearing impaired occupant, visible signal required

Click to listen

Prepare For System Installation

Fire Notification Appliances

- Commercial fire notification devices must be 15 dBA above ambient noise levels in all occupiable spaces.
- Noise levels above 105 dBA will require a visual device.
- Anytime more than two visuals can be seen, they must be synchronized.

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Class Exercise
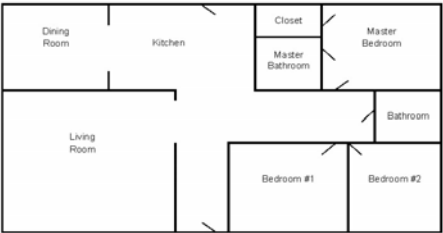
Where would you mount smoke detectors?

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Slide 9-65

Answer

Be careful to stay 3' away from the bathroom, kitchen and any air diffusers. Verify that one sounder is sufficient for 75dBA at the pillow.

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Slide 9-66

Prepare For System Installation

Other Considerations

Smoke detectors in every suitable room.
Heat detectors in rooms/area not suitable,
such as kitchens, utility rooms, attic, garages, etc.

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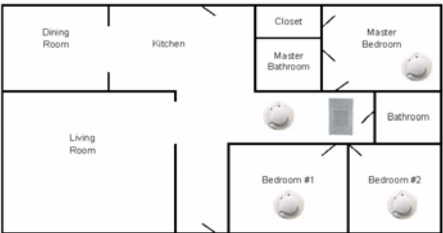
Slide 9-67

Class Exercise

Where would you mount smoke detectors?

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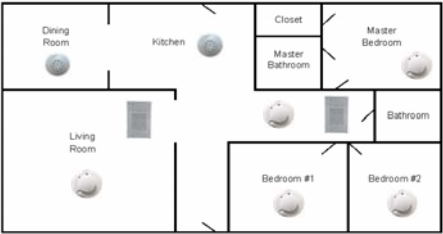
Slide 9-68

Answer

Be careful to stay 3' away from the bathroom, kitchen and any air diffusers.
Verify that two sounders are sufficient for 75dBA at the pillow.

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Slide 9-69

Prepare For System Installation

Other Considerations

Garage | Closet
Closet | Furnace/H2O | Laundry
Office/Bedroom # 4 | .5 Bath | Fireplace
Master Bedroom | Kitchen | Living Room | Closet | Bedroom # 2
Master Bathroom | | Closet | Closet | Bathroom
Closet | Closet | Dining | Entry | Den | Closet | Bedroom # 3
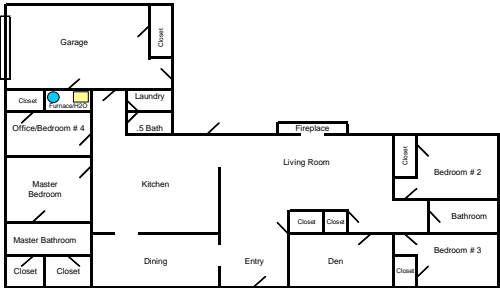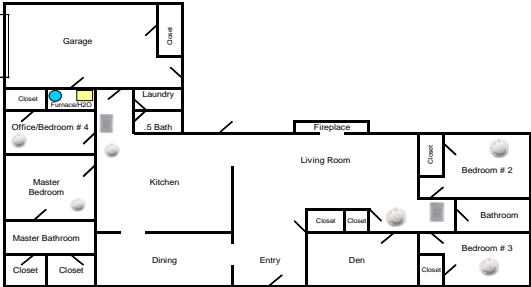
Smoke detectors in every suitable room. Heat detectors in rooms/area not suitable, such as kitchens, utility rooms, attic, garages, etc.

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Slide 9-70

Testing Fire Devices

- Follow manufacturer's instructions
- Testing smoke detectors may include using a magnet to draw an obstruction into the smoke sensor chamber. May also include using canned smoke to functionally test the detector (this is NOT a calibrated sensitivity test)
- Make sure that device trips control and sends signal to the monitoring station

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Section 9-3

Finalize sensors
Access Control Devices

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Slide 9-72

Prepare For System Installation

Access Control Doors

- Special Hardware may be required for certain doors.

L Bracket   Z Bracket
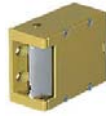
Door Strike for In-swinging Door

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Slide 9-73

Access Control Doors

- How much force will the magnet need to withstand? Can the door withstand more?

1200 pound mag-lock

Dual 600 pound mag-locks

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Slide 9-74

Access Control System

- Will the customer need to track or count people accessing or egressing the facility?

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Anti-passback

- Feature that will not allow any access/egress credential to enter again unless it has been used to exit.
- Used to keep employees from handing their credential to someone else.

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Access Control & Fire Systems

NFPA 72 requires access control doors to unlock upon receipt of a fire signal OR within 10 minutes of the loss of power to the fire alarm system.

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Access Control System Administration

- Who will be responsible for enrolling and deleting credentials?
- How will those credentials be added and deleted?

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Prepare For System Installation

Control Equipment

- Central or On Line Processing – Systems where all systems information is stored in a central location and all go or no-go decisions are made by this unit
- Distributed Processing – Systems where some of the system information is stored at the individual readers or controllers.

Slide 9-79

Control Equipment

- Degraded Mode – Feature of an access control system which allows a card reader to operate independently of the system's central control unit.

Slide 9-80

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Section 9-3

Finalize sensors Surveillance Devices

Slide 9-81

Prepare For System Installation

Camera Types

- **Board**
- **Bullet resistant**
- **Covert**
- **Dome**

- **Bullet**
- **Hi-def day/night**

- **Full body**
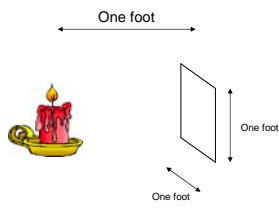
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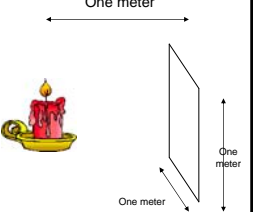
Camera Lighting

One Foot Candle   **One Lux**

One foot   One meter

One foot   One meter

One foot   One meter

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Camera Lighting

Typical Light Levels in Lux

.01	New Moon	500	Typical Office
.1	Full Moon	500	Libraries
5	Street Light	750	Supermarket
10	Twilight	20,000	Cloudy Day
150	Warehouse	100,000	Sunny Day

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Prepare For System Installation

Resolution

- All NTSC cameras (composite) are limited to 525 lines of vertical resolution Only 480 lines are actually displayed
- Lines are interlaced (shows every other line). This is called a field. Two fields make up a frame.

Slide 9-85

Fields vs. Frames

Two fields of 272.5 lines are inter-laced for a 525 line frame.

Only 480 lines are visible.

Progressive scan has no interlacing.

Slide 9-86

Resolution Chart
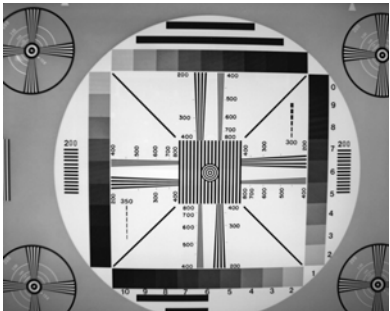
Slide 9-87

Prepare For System Installation

Resolution

- There are also high definition (mega-pixel) cameras.
- A pixel is a dot on a computer screen. It is the smallest element of data in a video image.

- Common resolutions:

720 x 480	1280 x 1024
800 x 600	1280 x 720
1024 x 768	1600 x 1200
1920 x 1080	

Slide 9-88

Mega-pixel Camera

- High definition cameras have much higher resolution that NTSC.
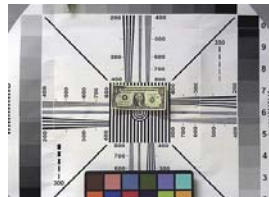
Slide 9-89

Lens

- Focal length is distance between imaging device (chip) and the lens. The smaller the number (4mm) the wider angle. The larger the number (75mm) the more tele-photo.

Camera Lens 4mm

Camera Lens 16mm
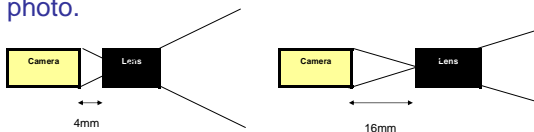
Slide 9-90

Prepare For System Installation

Lens

- How to find out what size lens is needed?

Lens Wheel   **Range Finder**   **Web-site**

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Slide 9-91

Mounts

- Indoor or Outdoor
- Light, Medium, or Heavy Duty
- Dome or Breadbox
- Heated / Cooled / Wipers / Washers
- Bullet Resistant
- Explosion Proof

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Slide 9-92

Camera Mounts

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Slide 9-93

Prepare For System Installation

Monitors

LCD

Advantages

- Excellent color reproduction
- Relatively inexpensive
- Lightweight

Disadvantages

- Image fades slightly when seen from extreme angles from sides or from above or below
- Burn In may occur in extreme situations (very bright still images left on-screen for days) but much less likely than with plasma or even standard tube TVs

Plasma

Advantages

- Excellent (real) contrast ratios and black levels
- Excellent color reproduction
- Excellent life expectancy
- Excellent viewing angle with no real loss of color or contrast

Disadvantages

- Fixed resolution
- Thin, fairly heavy & fragile
- Potential for screen burn in (Screen savers may compensate)
- Gaps between pixels render a sort of "screen door effect" on lower resolution models
- Low peak brightness

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Slide 9-94

Recording

- How many frames (fields) per second?

    24 frames per second – Motion Pictures
    16 frames per second – Home Movies
    60 flickers per second – incandescent bulb
    30 frames per second – typical for audio recordings

    Real time = ?

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Slide 9-95

Recording

- Video Cassette Recorder (VCR)– Magnetic recorder which records live CCTV picture in black and white or color, with sound onto a cassette containing magnetic tape.

Advantages:

- Inexpensive
- Easy to operate

Disadvantages:

- High maintenance
- Searching can be time consuming
- Tapes are limited to use(s)
- Non-networkable

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Slide 9-96

Prepare For System Installation

Recording

- Digital Video Recorder (DVR)– Computer based recorder that holds video and/or audio files on a hard drive. Cameras / microphones tie directly to DVR.

Advantages:

-Inexpensive
- Easy to operate
- Easy to search for archived data
- Networkable

Disadvantages:

- Computer based (hard drive issues)
- More user training

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Slide 9-97

Recording

- Network Video Recorder (NVR)– Computer based recorder that holds video and/or audio files on a hard drive. Cameras / microphones tie to same network that NVR is tied to.

Advantages:

-Inexpensive
- Easy to operate
- Easy to search for archived data
- Networkable

Disadvantages:

- Computer based (hard drive issues)
- Dependant on network
- More user training

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Slide 9-98

Archiving

- How long does the customer want to be able to view past events?

- For VCRs:

Hours	FPS
2	60
6	20
12	10
24	5
48	2.5
72	1.3
168	.7
960	.125

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Slide 9-99

Prepare For System Installation

Archiving

- For Digital Video Recorders (DVR) and Network Video Recorders (NVR), length is based on resolution of each image and ability to record based on pixel change.

- Check with manufacturer for file size.

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Section 9-4

Select & Locate Control

Selecting the Control

- Number of sensors
- Number of sensor locations
- Types of sensors
- Need for partitions
- Power requirements
- Ability to get wires to each sensor

Prepare For System Installation

Zoned Panel or Point ID

- Zoned panels will give you a specific number of circuits
- Point ID or addressable panels will identify each device individually

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Slide 9-103

Decide on Zones

You will need at least one zone for each type of device:

- Entry Exit
- Perimeter Instant
- Interior and/or Interior Follower

- Fire Manual
- Fire Automatic
- Panic or Silent Holdup
- Environmental
  - Flood
  - Cold
  - Heat
  - Gas

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Add Zones for Locations

Breaking large numbers of sensors or large areas into separate zones will help reporting and troubleshooting

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Partitions

If separate areas need to be controlled individually - partitions or additional panels may need to be added

Ex: maid or guest rooms, separate areas of businesses

Slide 9-106

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Calculate Power Requirements

- Check manuals for power (amps) used by each device
- Remember to use a common scale
  - Convert everything to amps or milliamps
- Remember the keypad(s), the audible device(s) motion and glass break sensors
- Add up all devices to find your total requirements

Slide 9-107

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Wired or Wireless

- If you are unable to get wires to each sensor, wireless controls are the best bet
- If you can wire to any device, either option will do
- If you can wire to some locations and not others, hybrid controls with wireless and wired capability are an option

Slide 9-108

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Prepare For System Installation

Locate Central /Main Components

- Check manufacturer's recommendations
- Range of temperature
- Range of humidity
- Degree of dust or dirt laden air

Locate Central /Main Components

- Position to ensure continued access for adjustment or repair
- Position to reduce attack or tampering
- Protect from accidental physical damage
- Avoid sources of EMI- Electromagnetic Interference (transformers, radio transmitters)

Control Location Considerations

- Visibility of devices
- Accessibility to unauthorized personnel
- Difficulty of installation
- Difficulty of connection to power and communication wiring
- Difficulty of connection to sensor wiring

Prepare For System Installation

Class Exercise

Where do you usually put the control and why?

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Slide 9-112

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Locating (Security) Audible Devices

- Audibility
- Conceal if possible
- Accessibility to unauthorized personnel
- Difficulty of installation
- Difficulty of connection to control
- Check manufacturer's recommendations

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Slide 9-113

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Locating Transformers

- Accessibility to unauthorized personnel
- Range of temperature
- Difficulty of installation
- Difficulty of connection to control
- Avoid GFCI circuits
- Check manufacturer's recommendations

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Slide 9-114

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Prepare For System Installation

Locating Remote Keypads

- Proximity to entry-exit doors
- Accessibility to unauthorized personnel
- Difficulty of installation
- Difficulty of connection to control
- Check manufacturer's recommendations

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Slide 9-115

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Section 9-5

Select wiring paths

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Slide 9-116

Wiring Methods

- Home Run- a wire is run from each device to the control
- Common Loop- wire is run to several locations from the control
- Splice box- wires are run from each device to a splice box where they connect to a common wire or a multiconductor cable

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Slide 9-117

Prepare For System Installation

Standards for Wiring

- National Electrical Code
- Manufacturer's instructions for each device

Slide 9-118

Commercial Wiring Paths

- Telecom/data closets/spaces can provide a path between levels
- Drop ceilings
- Raised floors
- Interior walls are often hollow

Slide 9-119

Residential Wiring Paths

- Closets can provide a path between levels
- Attics
- Unfinished basements
- Crawl spaces
- Interior walls are often hollow
- Under carpet
- Behind molding
- Drop ceilings
- Area around return vents or plumbing chases

Slide 9-120

Prepare For System Installation

Unacceptable Paths

- Elevator shafts
- Inside vents
- Attached to hot water pipes
- Attached to sprinkler pipes
- Attached to gas pipes

Slide 9-121

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Protecting Wiring

Exposed surface wiring can be protected with:
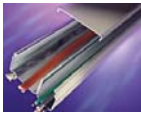
Wiremold

Conduit

Greenfield

Slide 9-122

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Splices & Connections

- Solid Connections are Critical
  – Punch down blocks
  – Terminal strips
  – Crimp type solderless connections
  – Wirenuts
  – Soldering

Slide 9-123

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Prepare For System Installation

Wire Types

- Wire varies by
  - Conductor size (AWG)
  - Type of insulation or jacket
  - Solid or Stranded
  - Shielded or not
  - Type of stranding to match bandwidth

AWG

- American Wire Gauge
  - Indicates the diameter or cross section of a conductor
  - Represents current carrying limitations due to resistance
  - Lower the number the thicker the wire

Wire Categories

- Level 1 = Plain Old Telephone Service (POTS)
- Level 2 = IBM Type 3 cabling system
- Cat 3 = 16 MHz (10 Mbps) 100 Ohm UTP
- Cat 4 = 20 MHz (16 Mbps) 100 Ohm UTP
- Cat 5 = 100 Mhz (100 Mbps) 100 Ohm UTP

Prepare For System Installation

Length : Resistance

- NFPA-70, the National Electric Code provides information about the amount of resistance per 1000' of a conductor based on its gauge size

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Slide 9-127

Resistance Adds Up

- Wire Resistance is more critical for power consuming devices
  - Main wire from transformer to control
  - Wire from control to audible devices
  - Wire from control to remote keypads
  - Ground wire
- Read the manufacturers instructions or call if not listed

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Slide 9-128

Solid vs. Stranded

- Solid indicates a single strand of a particular gauge conductor
  - More rigid / less flexibility
  - More susceptible to breakage
- Stranded indicates multiple strands composing a single conductor
  - More flexible
  - Less likely to break when nicked or bent

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Slide 9-129

Prepare For System Installation

Shielded

- An overall metallic covering over the conductors
- More costly
- Much more immune to RFI & EMI
- Shield must be connected to a ground source to work (typically at one end only)
- A must if required by manufacturer's installation instructions

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Slide 9-130

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Jacketed

- An overall protective covering for two or more conductors
- Adds a second insulation layer
- Takes the abuse of installation instead of the conductor insulation
- Helps prevent ground faults and short circuits
- Provides additional tensile strength to the cable

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Slide 9-131

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Twisted

- Each pair of conductors within the same jacket are twisted independently from other conductors
- Greatly reduces EMI and induction
- Greatly reduces induction between pairs within the same cable

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Slide 9-132

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Prepare For System Installation

Impedance

- A wire specification applying primarily to coax cables
- Typically 75Ω for CCTV and LAN wiring.
- Can affect picture quality
- Can affect data reliability if incorrect

Slide 9-133

Radio Frequency Interference

- Comes from transmitters on a nearby frequency
- Comes from a more powerful source
- Can cause wireless systems to false alarm or "jam" a modules transmission to the panel, causing no alarm or supervisory
- Perform placement tests on each transmitter in a wireless system as per manufacturer's instructions

Slide 9-134

EMI

- Electro-magnetic Interference- Sources:
  - Switching of loads
  - Radio and TV broadcasts
  - Poor grounding
  - Lightning
  - Heavy equipment operations
  - Electric motors close to sensitive electronics

Slide 9-135

Prepare For System Installation

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Section 9-6

Develop a job plan

Slide 9-136

Job Plan Considerations

- Job documentation
- What you learn on the survey
- Existing building or under construction?
- Availability of work site
- Availability of equipment

Slide 9-137

Job Plan Considerations

- Sequence -is one item required for another?
- Availability of workforce
- Permit or inspection requirements
- Schedule of other trades
- Weather
- Access to job site

Slide 9-138

Prepare For System Installation

Common Trades

- General Contractors
- Electricians
- Plumbers
- Carpenters

Class Exercise

Name some challenges you have had with other trades on jobs

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Section 9-7

Preassemble

Prepare For System Installation

Complete pre-assemblies & fabrication of sub systems

- Review instructions
- Assemble devices as much as possible before installation
- Mount back boards
- Install mounting brackets

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Section 9-8

Pretest

Pre-test Components

- Check wiring for continuity (complete circuit)
- Check for grounds
- Verify available voltage
- Check instructions for applicable tests

Prepare For System Installation

Class Exercise

Use the provided documentation to:

- Create a work order
- Complete a parts list
- Verify that equipment is appropriate
- Select equipment locations
- Do battery calculations
- Complete a job plan

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Slide 9-145

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Wireless Systems

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Wireless Systems

Chapter 10

Slide 10-1

Wireless Systems

- Typically refers to initiating devices communicating to the control panel via radio frequencies

Slide 10-2

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Section 10-1

Wireless Alarm Components

Slide 10-3

Wireless Systems

When Should I Use Wireless Transceivers?

- When a wired connection is not an option
- When the cost of pulling wire is equal to or more than the cost of the required transmitting and receiving equipment
- May allow the job to be completed with less labor to offset the cost of additional equipment
- Some systems allow you to use whichever method is most cost effective on the same system

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Slide 10-4

Typical Range

- Depends on the construction of the building and the equipment used
- Most manufacturers cite a typical outdoor line of sight range of up to 1000 feet and a range inside the building from 300 to 500 feet
- Because the RF signals will penetrate wood, concrete and stone, but not metal, the range will vary from building to building and perhaps within the building

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Slide 10-5

How Can I Be Sure the Equipment Is Going To Work?

- Temporarily install the equipment you will use is the most effective way to know for sure
- Testing after the building construction is completed

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Slide 10-6

Wireless Systems

How Do Systems Vary?

- Systems use a variety of antennas to focus the signals and most use either the 900 Mhz or 2.4 Ghz frequencies to communicate.
- Because both of these frequency ranges are used by other devices, some manufacturers use spread spectrum technology to reduce interference and also reduce the chance of illegal monitoring

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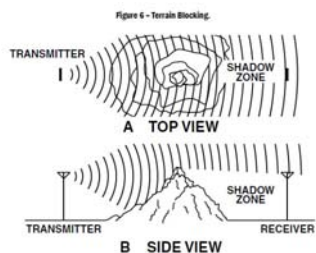
Spread Spectrum

- Form of wireless communications in which the frequency of the transmitted signal is deliberately varied to provide greater bandwidth and also reduces the impact of interference

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Signal Blocking

Figure 6 – Terrain Blocking.

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Wireless Systems

RFI- Radio Frequency Interference

- Signals from amateur radios, CBs, and radio and television stations
- Can interfere with data transmissions
- Can Block Radio signals

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Slide 10-10

Radio Frequency Interference

- Comes from transmitters on a nearby frequency
- Comes from a more powerful source
- Can cause wireless systems to false alarm or "jam" a modules transmission to the panel, causing no alarm or supervisory
- Perform placement tests on each transmitter in a wireless system as per manufacturer's instructions

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Slide 10-11

Limited Battery Life

- Typical lifespan for wireless batteries is 1-5 years.
- Will need additional service calls to replace batteries

Lithium

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Slide 10-12

Wireless Systems

Section 10-2

Z-Wave

Slide 10-13

Have you heard of_____?

- ADT Pulse
- Alarm.com
- Total Connect
- SecureCom Wireless
- iBridge

Slide 10-14

Z-Wave – What is it?

Z-Wave is a wireless technology that makes regular household products, like lights, door locks and thermostats "smart". Z-Wave products "talk" to each other wirelessly and securely and can be accessed and controlled on your phone, tablet or pc.

Slide 10-15

Wireless Systems

Devices

There are currently over 1,000 Z-Wave compatible devices, including

- Door locks
- Light switches
- Electrical outlets
- Alarm sensors (burglary, fire, CO, water, etc.)
- Thermostats
- Window shades
- Many more

Slide 10-16

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Wiring

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Wiring

Chapter 11

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Slide 11-1

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Section 11-1

Cable Preparation
and Wiring

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Slide 11-2

Routing cable and wire

• Keep your wiring neat

D rings

Structured Cabling
Enclosure

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Slide 11-3

Backboard Installation

- Pre designed back boards may save time

Backboard for M Blocks

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Rack, Patch Panel & Connection Box

- Consider Patch panels

M Block Mount   M or 66 Block   110 Block with legs

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Connection & Mounting Boxes

Mounting Boxes are available to help you mount the device and conceal holes made to route wiring

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Wiring

Service Loops

- Allow enough cable after you make your connections to:
  – Remove the device for service or adjustment
  – Replace it with a similar device
  – Eliminate any strain on the cable and connectors

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Residential Cabling Distribution

- Find areas for splice boxes that will be accessible for service
  – Closets
  – Attics
  – Crawl Spaces
  – Basements
  – Utility rooms

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Commercial Cabling Distribution

- Find areas for splice boxes that will be accessible for service
  – Closets
  – Drop Ceilings
  – Crawl Spaces
  – Basements
  – Utility rooms
  – Phone closets
  – Computer rooms

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Wiring

Home Run vs. Connection Box

- Home run wiring saves on splicing isolates each device with its own wire
- Splice box wiring allow consolidation of runs and provide intermediate test points

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Slide 11-10

Splicing

- Splicing is a critical part of the job
- Proper connection of wiring avoids service calls and false alarms
- Use
  - Solder and tape
  - Solder and crimp
  - Crimp with proper connector & tools
  - Terminal or barrier strips or punch blocks

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Slide 11-11

Supervision

- Connect to allow supervision of devices
- Wire in and out of each device
- No "T" taps

Good

Bad
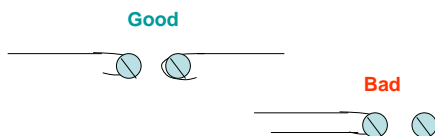
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Slide 11-12

Wiring

Supervison

In the Panel
IS NOT
End of Line

Put the end of line device after the last device

Slide 11-13

Match the Connector

- Each type of wiring system has an appropriate connection method and/or connector
- Connectors need to match the wire type and gauge

Slide 11-14

Crimp Type

B Connectors

Spade lugs

Crimp Connector

Butt Splice

Quick Disconnect

Slide 11-15

Wiring

Twist on or Push type

Wire Nut

Push In Connector

Terminal Strips

Barrier Strip

Terminal Strip

RJ45 Connectors

• Follow the specifications for your use
• Use a crimp tool

Wiring
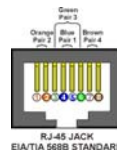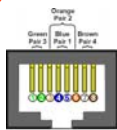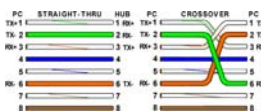
Coaxial Connectors

- Read and follow the manufacturers directions for each type of Coax Connector
- Crimp types require a crimp tool
- Twist on and soldered types require proper cable preparation

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Slide 11-19

Crimp Connectors

- Use a proper tool to provide even compression on all sides of crimp connectors

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Slide 11-20

Fiber optic, ST, SC connectors

- Fiber optic termination and connections require special training beyond the time constraint of this course.
- Contact your supplier for appropriate training
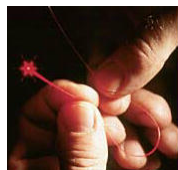
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Slide 11-21

Wiring

Standard 4-Pair UTP Color Codes

Pair	Tip	Ring
1	White/Blue	Blue/White
2	White/Orange	Orange/White
3	White/Green	Green/White
4	White/Brown	Brown/White

An example of a wiring color code for phone lines

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Section 11-2

Wire Buildings

Secure Area

- Secure each area prior to commencing work
  - Use a drop cloth to avoid damage to carpet or flooring
  - Ensure that extension cords are taped down or are not in traffic paths
  - Use a safety cone to indicate hazards

Kids and Animals

- Keep your tools and parts in a secure area
- Kids and pets may be attracted to them
- Unsupervised access may lead to misplaced items or injury

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Slide 11-25

Careful With Tools

- Watch where your tool belt swings
- Use care where you place:
  - Soldering guns and irons
  - Hot drill bits
  - Glue guns
  - Sharp tools

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Slide 11-26

Tools to Fish Wire

Pull Rods

Fish Tape

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Slide 11-27

Wiring

Tools to Fish Wire

Flex Drill Bit

Stud Sensor

Slide 11-28

Pre-wiring

- In new construction it is to your advantage to run wire through exposed studs and framing before walls are closed in with drywalls or other wall coverings
- Wire should be fastened to prevent damage
- Wire should be protected with kick plates or other protection where nails or screws might hit the wire

Slide 11-29

Existing Commercial Buildings

- Most interior walls in commercial buildings are hollow
- Remove a wall plate to verify
- Drop ceilings provide access to walls
- Ceilings should not be used to support the wiring.

Slide 11-30

Wiring

Existing Residential Buildings

- Crawl spaces unfinished basements and attics can provide access to walls.
- When wiring can not be fished through walls try:
  - Concealing behind molding or baseboard
  - Concealing under carpet
  - Using surface mounted wire mold to conceal the wiring

Slide 11-31

Fishing Wires

- If door or window lines up toward the center of the attic you should be able to drill straight up
- Once the hole is drilled, use the bit, a fish tape or pull rod to fish the wire
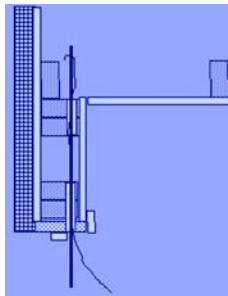
Slide 11-32

Fishing Wires to Attic

- If door or window lines up toward the outside of the attic, the pitch of the roof may make it more difficult
- Drill the hole with care to avoid going thru the roof

Fig A
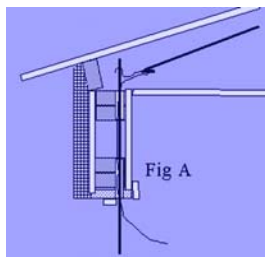
Slide 11-33

Wiring

Fishing Wires to Attic

- Extend a fish tape through the hole
- If you are lucky the tape will follow the roof contour to the center of the attic
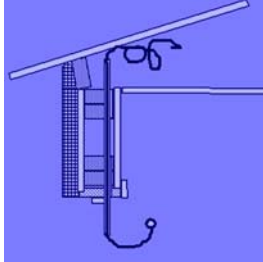
Slide 11-34

Fishing Wires to Attic

- If not you will need to use another tape or rod to hook the first tape
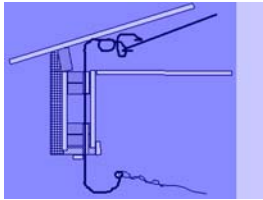
Slide 11-35

Fishing Wires to Attic

- To avoid drilling through the roof
- Measure the distance from where you enter the wall or jamb to the ceiling beforehand
- Mark it with tape
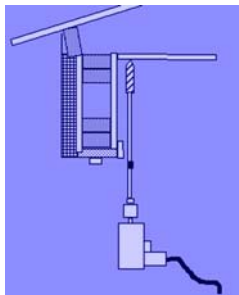
Slide 11-36

Wiring

Fishing Wires to Attic

- Drill carefully after the tape mark is reached
- You should feel a hollow space after you make it thru the ceiling and before you enter the roof
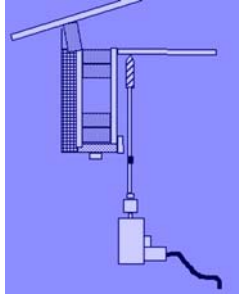
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Slide 11-37

Fishing Down To The Crawl Space

- Try letting gravity work for you
- Drop a weighted wire or pull line see where it goes

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Slide 11-38

Fishing Down To The Crawl Space

- You may need to drill up from the basement and down through the floor
- Drop a wire down and try to hook the wire from below with a fish tape
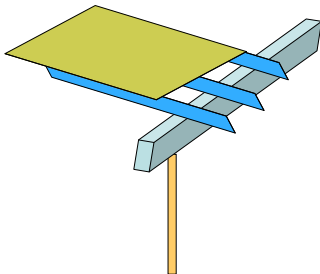
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Slide 11-39

Fastening Wire

- Match the appropriate wire or cable fastener to the situation

Cable Tie

Cable tie with Label

Cable Tie With Screw Mount

Nylon Cable Clips

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Slide 11-40

Fire Stops

– The horizontal double 2x4s on top of the vertical studs create firestopping in modern wall systems.
– When covered with drywall, each wall cavity will be sealed and separate from the one next to it.

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Slide 11-41

Fire Stops

– Older homes often have blocks of wood in the walls between the floor and ceiling.
– This stops the vertical movement of fire and hot gases .

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Slide 11-42

Wiring

Seal All Penetrations

- A fire stop, when properly installed, does exactly what it says. It stops the spread or advancement of fire from one section of a structure to another.
- If you drill a hole you break the fire stop.
- Seal it with an approved sealant

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Slide 11-43

Conduit

- Metal conduit such as Electrical Metallic Tubing (EMT) or Galvanized Rigid Conduit (GRC) can be bent to the angle you need
- Practice on scrap conduit

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Slide 11-44

Wiremold

Use to protect surface mounted wiring

For types visit www.wiremold.com
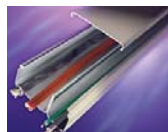
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Slide 11-45

Wiring

Rough in Device Component Locations

- Pull wire into any mounting or connection boxes whenever possible
- Use bushings to protect cable when pulling through sharp knockouts
- Leave enough slack for the connection and a service loop
- Clearly mark un-terminated cable to avoid damage by other trades

Label Tag Wire /Cable

- Use wire markers
- Record wiring runs on a floor plan
- Record wiring runs on a wire chart

Use Wire Markers

- Permanent "Sharpie" magic marker to write on the cable
- Preprinted Numbers or letters
- Custom labeling system

Wiring

Mark Wiring on a Floor Plan

25   26   10   11   12   13

27- Motion sensor

28- Keypad

Master Bedroom   Closet   Hall   Bath   Closet

23

Living Room

22

21   14

Dining Room   Kitchen   Bedroom A   Bath   Bedroom B

20   19   18   17   16   15

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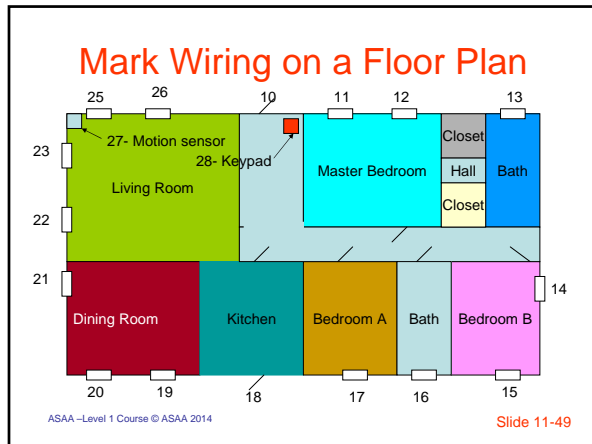
Slide 11-49

Record Wiring On A Wire Chart

- Mark each wire with a number or letter
- List the number and a description of the wires location and use

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Slide 11-50

Class Exercise

What was your most challenging site to run a wire and how did you solve it?

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Slide 11-51

Wiring

Section 11-3

Install Components
& Other Systems

Slide 11-52

Assemble Components

- The job will go faster and better if you:
  - Arrange all your components in a convenient location
  - Assemble all components that can be pre-assembled

Slide 11-53

Mount Components

- Read the instructions for location advice
- Remember to use a fastener to match the surface you are mounting to

Slide 11-54

Wiring

Mount Components

- Use a level to verify alignment
- Align visible devices with other devices
- Verify that you will have clearance to open or service the device

---

Mounting Recessed Door Contacts

- Drill your hole through the top jamb of the door
- Close and latch the door
- Tap firmly on the drywall above the door
- Open the door slowly. The debris that fell out of the wall when you tapped on it should form a perfectly located circle where you need to drill to set your magnet

---

Interference

- Check for things that might interfere with the operation of the device before you mount it
- Look on both sides of the wall

Wiring

Secure Mounting

- Tighten all screws and bolts on mounts and brackets to prevent movement of devices
- Make sure the surface you are mounting to is stable

Slide 11-58

Double Stick Tape

- Make sure the surface of the device and the mounting surface are clean
- Make sure the tape will support the weight of the device

Slide 11-59

Connect to Control & Distribution Wiring

- Match connectors to wire type
- Check to make sure the connector is rated for the environment and use
- Make sure it can handle the voltage and amperage
- Read the directions
- Crimp connectors as specified

Slide 11-60

Construction Sites

Protect components from dust, dirt and damage with boxes, plastic bags or packing material if you mount them before construction and cleanup are finished

Slide 11-61

Before You Connect Power

- Read the instructions
- Perform indicated tests
- Connect power in the specified sequence

Slide 11-62

Be Kind

- To yourself and your coworkers by documenting any devices that are mounted in less visible or hidden locations
- Let you coworkers know how to unlock or remove any special devices that you used to securely mount a device

Slide 11-63

Slide 12-1

Arkansas Security Alarm Association
Arkansas Level 1
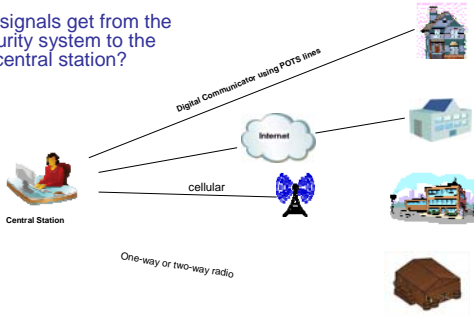
Communications

Chapter 12

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Slide 12-1

Slide 12-2

Communication

How do signals get from the security system to the central station?

Digital Communicator using POTS lines

Internet

cellular

Central Station

One-way or two-way radio

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Slide 12-2

Slide 12-3

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Section 12-1

Digital Communicators

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Slide 12-3

Communications

The RJ31-X

- The connection to the regular phone lines is made through the RJ31-X.
- This provides an FCC approved dividing line between the telephone equipment and our equipment.
- The RJ31-X, when properly wired, allows the alarm equipment to take priority over the phone lines when alarm signals need to be sent.

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Slide 12-4

RJ31-X Wiring
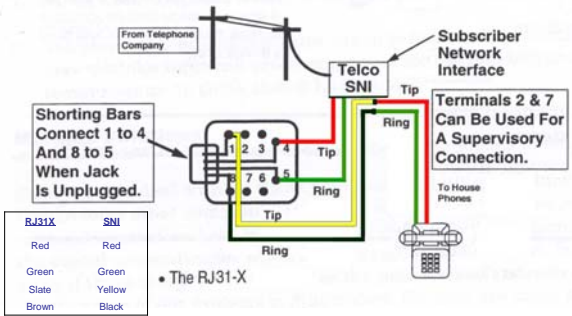
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Slide 12-5

RJ31-X Wiring (CAT5)

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Slide 12-6

Communications
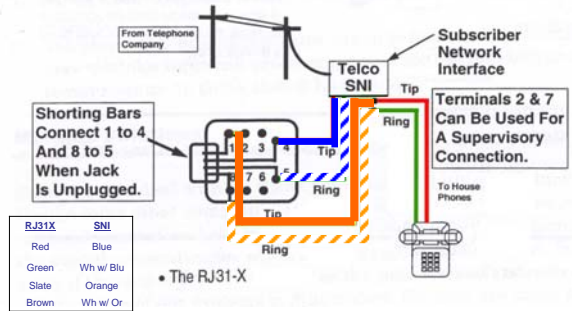
Line Seizure

- Notice the little yellow rectangular blocks behind wiring terminals.
- These are the line seizure relays.

- One is connected from T to T1
- The other from R to R1
- When all is well the relays are in the closed position.
- When there is an alarm the relays open disconnecting the house phone
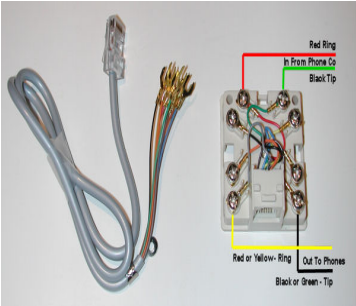
Slide 12-7

Color Code For Wiring

Notice wire colors.
At top of jack red connects to red and green to green but at the bottom the yellow wire connects to the slate wire and the black wire to the brown wire terminals.

Research done by Moose 15 yrs. ago showed more surge protection by using a longer cord and leaving it wrapped as packed as much as possible.

Red Ring
In From Phone Co
Black Tip

Red or Yellow- Ring   Out To Phones
Black or Green - Tip

Slide 12-8

Subscriber Network Interface
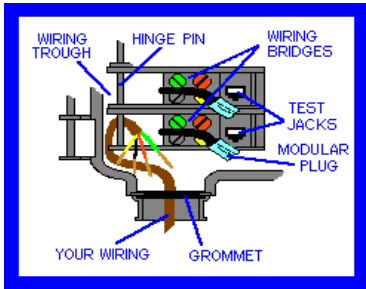
- Point where the phone company responsibility stops and site owners begins

Slide 12-9

Communications

SNI
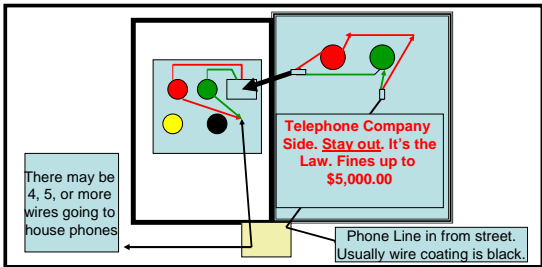
Drawing shows customer side of interface

Slide 12-10

Common Residential Telephone Interface (SNI)

Telephone Company Side. **Stay out**. It's the Law. Fines up to $5,000.00

There may be 4, 5, or more wires going to house phones

Phone Line in from street. Usually wire coating is black.

Slide 12-11

SNI- Points to Remember

- Check voltage make sure no one is talking when you disconnect wiring.
- Make sure there is no connection between Red to Yellow or Green to Black.
- Make sure Yellow and Black terminals are not used as a second phone line.
- Check and record the phone number the RJ31X Jack is on.

Slide 12-12

Communications

SNI- Points to Remember

- Always use terminals in the interface. Don't connect around the box it has grounding protection.
- Make sure all house phones get reconnected. Old wires break easily.
- With RJ31X jack in place voltage should read 48 to 52 volts DC

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Slide 12-13

Every Monitored Account Needs

- Receiver
  – Phone Number / IP Address / Frequency
- Account Number
- Communication Format
- Zone Types
- Signal Types

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Slide 12-14

Receiver Phone Number / IP Address

- The phone number or IP Address that the control panel needs to reach your central station receiver

* Remember, fire systems have special requirements. See NFPA 72, Chapter 8

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Slide 12-15

Communications

Account Number

- Typically 3 – 6 digit number that identifies home or business
- May have a receiver and line card number, in front of the actual number that you program

01 – 05 – 1234
Receiver   Line Card   Account Number

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Duplicate Accounts

- Caution –
- The same line card number and account number may be used on another receiver in the same central station
- Make sure you select the right phone number or IP address

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Communication Format

- The control communicator at the alarm site sends digital data to a receiver at a monitoring center
- The format is like the language (English , French, etc.)
- The format used at the control communicator must match the format used at the receiver

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Communications

Common Formats

- Contact I.D.
- SIA
- Modem IV
- Modem IIIa^2
- Modem IIe
- DMP
- ITI
- 4 x 2
- 3 x 1

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Slide 12-19

Communication Format

Contact I.D. – Uses DTMF (touch tones)

Includes a four digit account number, one digit event code, three digit event identifier, two digit area, three digit zone/user number.

Example:

1234 E 134 01 001   and   1234 R 134 01 001

Where:

1234 = Account number   E or R = Alarm or Restore
134 = Delay perimeter zone   01 = Area number
001 = Zone number

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Slide 12-20

Communication Format

SIA – Uses binary frequency shift keying (BFSK).

Format may also include a number (1, 3, 8, 20) that represents how many signals are sent during each phone call.

Examples:

FA1   BA03   OP006 1

Includes: Four digit account number, Event (FA=Fire Alarm; BA=Burglary Alarm; OP=Opening), Zone/User Number, and may include an area/partition.

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Slide 12-21

Communications

Communication Format

Modem IIIa² and Modem IIe – Formats that are proprietary to Bosch (formerly Radionics and Detection System) panels.

Four to ten digit account number, one digit identifier, three digit user/zone number, point text.

Examples:

1234 A 001 Alarm Zone 1 Back Door
1234 R 001 Restore Zone 1 Back Door
1234 N D25 Test Signal

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Communication Format

DMP – Uses Synchronous Data Link Control (SDLC), a networking communication format invented by IBM.

Reports up to 47 Characters including keypad displayed information:

Example:
1234 – Area: 01 – Main Bldg   Open: User 101 John Doe

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Communication Format

ITI – Format type that includes a five digit account number, one digit event identifier, and three digit user/zone number.

Examples:

12-345 A001
12-345 W001
12-345 R001

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Communication Format

Pulse – Including 3x1, 3x1 extended, 3x2, 4x2, and 4x3. May include hexi-decimal (replacing numbers with letters). First number is number of digits in account number. Second number represents the number of digits in the event code.

Examples:

123 1 (3x1 format, account # 123, event type 1)

123 01 (3x2 format, account # 123, event type 01)

1234 16 (4x2 format, account # 1234, event/zone 16)

1234 E6 (4x2 format, account # 1234, event E, zone 6)

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Section 12-2

Cellular Communicators

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What is Cellular Service?

A terrestrial radio-based service providing two-way communications by dividing the serving area into a regular pattern of sub-areas or cells, each with a base station having a low-power transmitter and receiver. Although cellular radio is primarily a means of providing mobile telephone service, it is also used to provide data services and private voice services, and as an alternative to fixed wired telephone service where this is scarce. Source: World Trade Organization

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Communications

1G, 2G, 3G, or 4G/LTE, 5G

"G" stands for generation.
"LTE" is long term evolution

How mobile networks work

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Slide 12-28

1G or AMPS

- Analog Mobile Phone Service

- Introduced in America in 1973
- First used in alarm systems in about 1992
- Sunset in 2008

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Slide 12-29

2G and 2.5G

- Second Generation of cellular service
- Digital communications
- Introduced in 1990
- Life expectancy of 25 years
- Alarm systems typically use GPRS (Global Packet Radio Service) for primary communications with SMS (Short Message Service) for backup.
- Sunset began in 2012, expected to last until 2017.

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Slide 12-30

Communications

3G

- Introduced in 2005
- Life expectancy of 25 years
- Also called HSPA (High Speed Packet Access)
- Completely different technology than 1G and 2G networks
- Does NOT support voice or text messaging
- Better for data (smart phones)

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Slide 12-31

4G / LTE

- Introduced in 2009
- Operates on a different wireless spectrum than 3G
- Includes Wi-Max (Sprint), LTE (AT&T, Verizon, T-Mobile) and HSPA+ (AT&T Mobile and T-Mobile Plus)
- Faster data
- No voice or text messaging

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Slide 12-32

GSM or CDMA

- The infrastructure that cellular companies use
- Global System for Mobiles
- Code Division Multiple Access
- 7 of the 10 biggest cell carriers in the US use CDMA
- Europe is mostly GSM
- Alarm systems typically use GSM

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Slide 12-33

Communications

Coverage Map (CDMA)

Slide 12-34

Coverage Map (GSM)

Slide 12-35

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Section 12-3

Network
Communicators

Slide 12-36

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Communications

Domain Name System

Since it is easier to remember google.com than it is 74.125.227.65, we use Domain Name Servers to translate IP addresses into useful names.

Like using landmarks and store names rather than latitude and longitude when giving directions.

Alarm systems must use IP addresses, not DNS Per U.L.

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Slide 12-37

Protocols

TCP/IP
Connection

UDP
Connectionless

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Slide 12-38

Networks

ABC Office Bldg
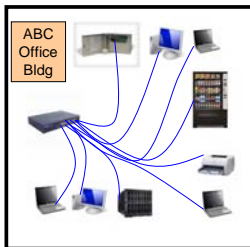
Example of a local area network (LAN)

LANs typically go up to and include the router or firewall.

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Slide 12-39

Communications

Networks

ABC Alarm Company's Wide Area Network

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Slide 12-40

IPv4

- 32 bit addresses (looks like 192.168.1.1)
- Limited to 4,294,967,296 addresses
- Ran out on February 3, 2011
- Most commonly used by alarm system / receiver manufacturers
- Most will require port forwarding or NATing

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Slide 12-41

Ports

Address: 74.125.225.228

Every IP address has 65,535 doorways (or Ports) that can be used to access that address.

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Slide 12-42

Communications

Spacely Alarm Company – Little Rock

Receiver
192.168.1.100

Terminal Services
192.168.1.125

Router
74.125.225.228
192.168.1.1

Internet

DVR
192.168.1.115

Laptop
192.168.1.108

Mr. Spacely's House
Hot Springs
76.38.110.12

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Slide 12-43
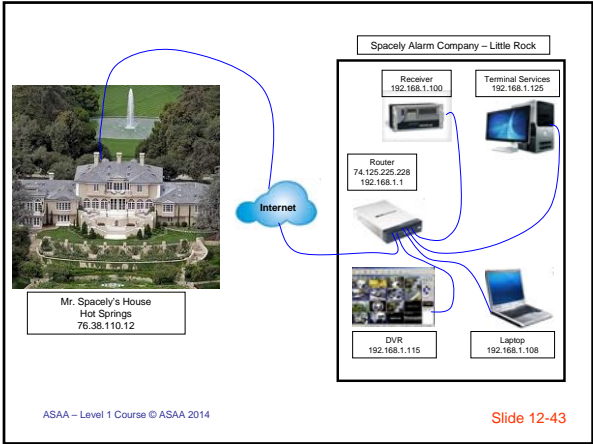
IP Address

Current IP Address

74.125.225.228

Add to Favorites

Command Prompt

```
C:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

      Connection-specific DNS Suffix  . :
      IP Address. . . . . . . . . . . . : 192.168.1.108
      Subnet Mask . . . . . . . . . . . : 255.255.255.0
      Default Gateway . . . . . . . . . : 192.168.1.1

C:\>_
```

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Slide 12-44

---

ipconfig

Command Prompt

```
C:\>ipconfig /all

Windows IP Configuration

      Host Name . . . . . . . . . . . . : Jordon
      Primary Dns Suffix  . . . . . . . :
      Node Type . . . . . . . . . . . . : Unknown
      IP Routing Enabled. . . . . . . . : No
      WINS Proxy Enabled. . . . . . . . : No

Ethernet adapter Local Area Connection:

      Connection-specific DNS Suffix  . :
      Description . . . . . . . . . . . : Intel(R) 82562V-2 10/100 Network Con
nection
      Physical Address. . . . . . . . . : 00-21-9B-1C-D0-10
      Dhcp Enabled. . . . . . . . . . . : No
      IP Address. . . . . . . . . . . . : 192.168.1.108
      Subnet Mask . . . . . . . . . . . : 255.255.255.0
      Default Gateway . . . . . . . . . : 192.168.1.1
      DNS Servers . . . . . . . . . . . : 151.164.1.8
                                          151.164.1.7

C:\>_
```

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Slide 12-45

Communications

tcping
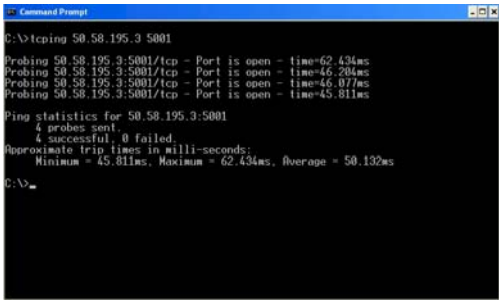
Slide 12-46

tracert
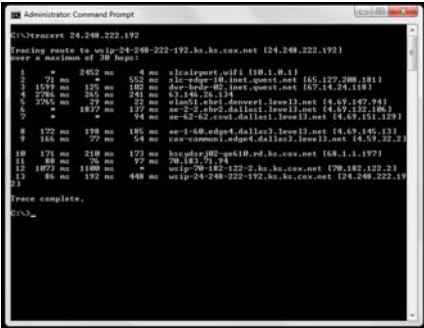
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Slide 12-47

tracert
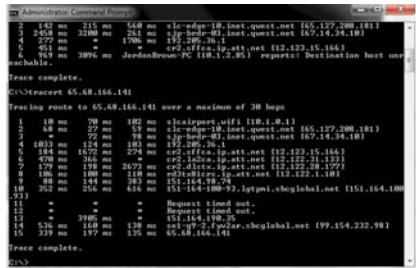
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Slide 12-48

Communications

IPv6

- The world ran out of IPv4 addresses on February 3, 2011.
- IP Version 6 uses 128 bit addressing.
- Creates 3.4×10^{38} addresses.
- IPv6 addresses are represented as eight groups of four hexadecimal digits separated by colons, for example 2014:0bd8:85a3:1041:8080:8a2a:0370:7443

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Slide 12-49

IPv6

- Most ISPs support both IPv4 and IPv6
- Security products manufacturers typically still only support IPv4

- IPv4 and IPv6 should both be supported for many years

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Slide 12-50

Arkansas Security Alarm Association

Central Station Course

Radio

Chapter 12-4

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Slide 12-51

Communications

Radio Communicators

- Unlike digital communicators, internet communicators, and cellular communicators, radio communicators do NOT involve a third party (phone or company) for service.
  Radio systems are generally maintained by the alarm company.

Slide 12-52

Radio Frequency

- The Federal Communication Commission (FCC) has set aside radio frequencies for use in alarm communications.
- Frequency allocation may be viewed at:
  *www.**fcc**.gov/oet/spectrum/table/**fcc**table.pdf*

Slide 12-53

Radio Frequency

- The Federal Communication Commission (FCC) limits the power of the radio communicators to two watts.

- Limiting the power of the transmitter also limits the range of the radio signal.
- Exceptions may be made.

Slide 12-54

Communications

One-way Radio Communicators

- Digital Alarm Radio Transmitters (DART) communicate without receiving any acknowledgement from the Digital Alarm Radio Receiver (DARR).
- Multiple transmissions are communicated in attempt to ensure that at least one transmission is received.

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Slide 12-55

Repeaters

Mount Rightintheway

Central Station

Joe Customer

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Slide 12-56

Two-way Radio Communicators

- Digital Alarm Radio Transmitters (DART) communicate and receive an acknowledgement from the Digital Alarm Radio Receiver (DARR).
- If the signal is not received, the transmitter re-transmits the signal again.

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Slide 12-57

Communications

Two-way communicator

Mount Rightintheway

Central Station

Joe Customer

Slide 12-58

Transceiver

- A device capable of sending and receiving signals.

Transceiver Unit

Slide 12-59

Two-way Radio Network

Central Station

Slide 12-60
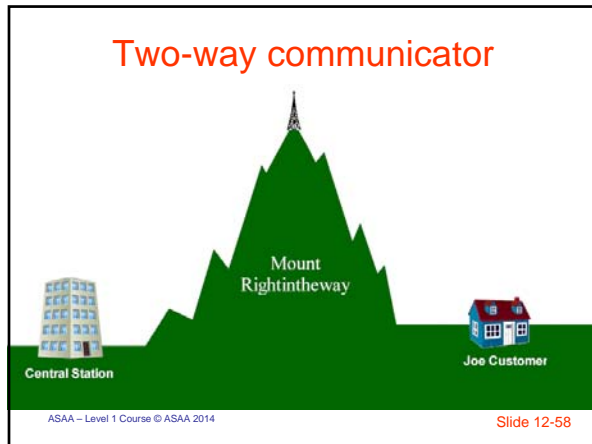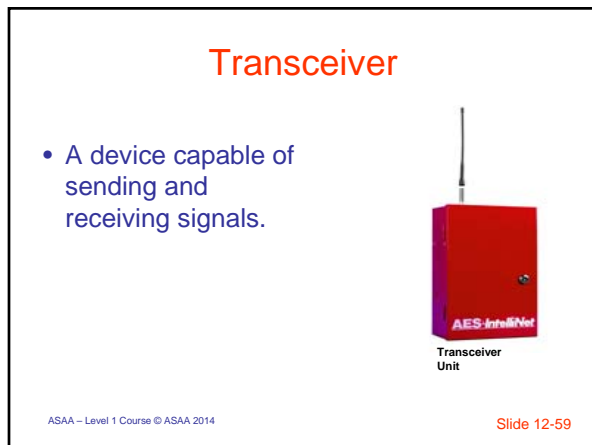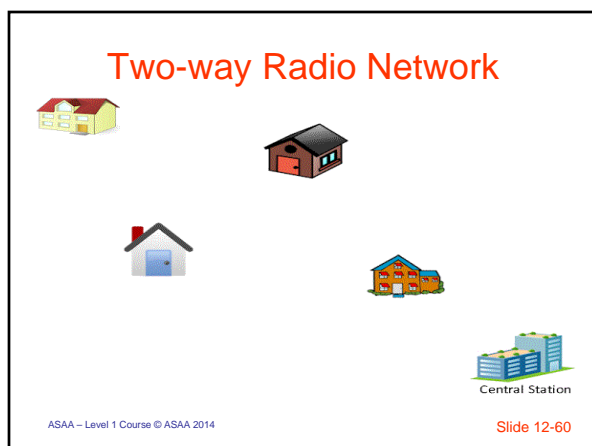
Communications

Radio Advantages

- Great for clients with no "home phone."
- Difficult to defeat
- Expanding radio network coverage
- Reliable
- Cost effective
- No third party service provider
- Fire communicator without backup

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Slide 12-61

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Radio Disadvantages

- No third party service provider
- Limited range
- Inability to up/download panels

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Slide 12-62

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Configure & Program

Chapter 13

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Slide 13-1

Calibrate & Align

- Many devices will require electronic or physical calibration
  - Motion sensors
  - Glassbreak sensors
  - Contacts
  - Wireless Transmitters

Read the Directions!

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Slide 13-2

Calibrate & Align

- Verify that the device works as it should
- Walk test
- Use recommended test equipment
- Make sure device is securely mounted

Read the Directions!

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Slide 13-3

Configure-Program

Labeling Devices

- Use names and labels that the customer, the police or fire authorities & your fellow workers will understand
- Will everyone know
  - where Billy's room is?
  - north, south, east or west?
  - Right or left, from inside or out?

Programming Methods

- Via control or keypad
- Via special programmer
- Via notebook or handheld computer
- Via a modem
- Via the internet

Avoid False Alarms

- Notify your monitoring center <u>BEFORE</u> you change a program
- Program changes may send accidental signals

Configure-Program

Notify Occupants

Let all occupants know when your program changes might result in trouble buzzers or alarm sounds

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Check Integration

The changes you make on one control device may impact another
  – Doors may lock, unlock or close
  – Elevators may be recalled
  – HVAC may be effected

Read the Directions!

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Learn the Options

• Familiarize yourself with the options for each step of the program
• Make sure that a change in one step of your program will not impact another area of the program

Read the Directions!

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Configure-Program

Install or enter control programs

- Gather needed information
  - Device locations & descriptions
  - Identification or account number assigned to the system
  - Special requirements- 24 hour zones, long entry and exit paths, etc.
- Decide on options

Slide 13-10

Save Before Updating

- When you update an existing program make sure you have a copy of the most up to date program BEFORE you make changes
- Remember that if you upload or download a program it will probably replace the existing copy of the program

Slide 13-11

Install or enter control programs

- Record needed information
  - Use templates or programming sheets.
- Enter the program
- Save the program
- Make notes to help those who come after you

Slide 13-12

Create Program Library

You can save time and avoid mistakes by creating program libraries for common situations
- Small Home
- Larger Home
- Commercial
- Etc.

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Slide 13-13

Zone Types

- How each zone will react to open, short, and normal conditions in the armed (away, stay) and disarmed modes.

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Slide 13-14

Zone Types

- **24 Hour**
  - On regardless of arm/disarm status
  - Initiates alarm immediately when tripped
  - Examples
    - Hold-up
    - Ambush
    - Emergency
    - Fire

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Slide 13-15

Configure-Program

Zone Types

- **Delay or Entry/Exit**
  - When violated, allows time to reach keypad for disarming
- **Instant**
  - If violated while system is armed, initiates an alarm immediately
- **Follower**
  - Instant if violated first, follows delay if entry/exit zone trips first

Zone Types

- **Smoke detector verification**
  - Upon activation, control will power down/restore power to device.
  - If zone trips again within time frame, fire alarm is initiated.
  - If zone does not trip within time frame, first trip is ignored.

  (For Smoke Detectors ONLY!)

Zone Types

- **Day Zone**
  - Trouble when disarmed, alarm when armed. (e.g. window foil, tampers)
- **Chime**
  - Sounds at keypads only

Configure-Program

Signal Types

- How each zone will report to the monitoring station under given conditions (opens, shorts, normal).
  - **Alarm -** Event that requires action (dispatch)
  - **Supervisory** - System is off normal
  - **Trouble** - System will not work as designed
  - **Restore** - System or zone is back to normal condition
  - **Cancel** - Previous alarm signal, or alarm in process, is to be disregarded.

Test and Verify

Verify proper system operation after each major program change

Restore the System

Notify your monitoring center after you have finished all testing to restore the system to normal operation.

Configure-Program

Record All Changes

Make sure that all documentation is updated when you make a change

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Control Panel Features

- Several Control Panel features can help to reduce false alarms if used correctly
- SIA – CP01 Standard establishes guidelines to be followed

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Abort Window

- A period of time that allows the user additional time to disarm the system before an alarm is transmitted.
- Too little time prevents the user from disarming the system after false alarms.
- All panels should be set to at least the default of 30 seconds established by the SIA CP-01 Standard.
- Time should be extended depending on environment or user.

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Configure-Program

Swinger Shutdown

- One trip will shut down a zone until it is restored by a manual reset or may be automatically reset after forty-eight hours with no additional trips on any zones.
- If swinger shutdown is set above 1, faulty equipment or environment will continue to cause a false alarm from the same source.
- All panels should be set to the default of 1 established by the SIA CP-01 Standard.

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Slide 13-25

Exit Delay

- Time allowed for user to arm (activate) the system and exit.
- Sufficient delay time will help reduce false alarms from the source.
- All panels should be set to the default of 60 seconds established by the SIA CP-01 Standard.
- A test should be performed to ensure all users can easily walk the distance in the time allowed.

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Slide 13-26

Exit Time Restart

- If the alarm user reenters premise prior to the end of the exit delay time, the exit time shall restart.
- Panels without this feature enabled will go into alarm if a person reenters at the end of the exit period.
- All panels should use this feature to allow the user time to reenter and reduce exit alarms.

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Slide 13-27

Configure-Program

Device Identification

- Various methods can be used to pinpoint the source of an alarm.
- If too many devices activate the same signal, it can be difficult to locate the source on an alarm.
- The number of devices wired to each zone should be limited to more accurately identify the source of a false alarm.

Slide 13-28

Entry Delay

- Period of time allowed, after entry to the premises, to disarm (deactivate) the security system before it notifies the monitoring company.
- If the user does not have enough time to disarm (deactivate) the security system, false alarms are likely.
- All panels should be set for at least 60 seconds (SIA default is 30 seconds)
- A test should be performed to ensure all users can easily walk the distance in the time allowed.

Slide 13-29

Call Waiting

- Call waiting feature allows customer to receive multiple calls on a single line.
- When the central station operator calls to verify the alarm when the alarm panel is still communicating, the operator will hear ringing and assume the site is not occupied.
- Codes to disable the call waiting feature should be added to the panel programming so that the operator hears a busy signal when the panel is using the line.

Slide 13-30

Test, Troubleshoot, Debug

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Test Troubleshoot & Debug

Chapter 14

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Slide 14-1

Testing & Troubleshooting Aids

- Instruction Manuals
- Test equipment
- Work Order
- Contract
- Blueprints
- Manufacturer help lines
- Web sites

- Your sense of
  – Smell
  – Hearing
  – Sight
  – Touch
  – Taste

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Slide 14-2

Read the Paperwork

- Instruction Manuals
  – Guide you on sequence of power up
  – Tell you how it should work and perform
- Work order
  – Lets you know what the customer expects
- Blue prints
  – Tells you where things should be
- Wire Chart
  – Identifies what is connected to what

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Slide 14-3

Test, Troubleshoot, Debug

Measure Voltage

- Verify meter setting and lead placement
  - On Voltage
  - On AC or DC
  - On range that you do not expect to exceed
- Place leads in **PARALLEL** with what you are measuring
- Disconnect a battery from the panel to measure the battery voltage or the charging circuit

Measure Amperage

- Verify meter setting and lead placement
  - On Amperage
  - On range that you do not expect to exceed
- Place leads in **SERIES** with what you are measuring

Measure Resistance

- Verify meter setting and lead placement
  - On Resistance
  - On range that you do not expect to exceed
- Disconnect from battery and panel
- Place leads in **PARALLEL** with what you are measuring

Test, Troubleshoot, Debug

Check Telephone Lines

- Use a Lineman's test set to:
  - Verify dial tone
  - Test ability to dial out
  - Check requirements to dial (Dial 9)
- Use a Meter to:
  - Verify if line is active
  - 48 to 52 volts DC on Hook
  - 7 to 9 volts DC Off Hook

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Slide 14-7

Testing New Systems

- Read the instruction manuals
- Perform tests indicated in the manuals
- Check that wiring and connections are complete
- Connect power in the sequence specified in the instructions
- Verify proper operation

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Slide 14-8

Troubleshooting

- Find the problem
- Identify a solution
- Implement the solution
- Verify proper operation
- Make sure that was the only problem
- Document problems and actions taken

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Slide 14-9

Test, Troubleshoot, Debug

Find the Problem

- Discuss the problem with the customer
- Compare the problem to past problems you have experienced
  - Look for common sources of problems

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Slide 14-10

Find the Problem

- Compare the current operation to desired operation
  - Ask your central station
  - Observe the situation
  - Test operation
  - Check voltage and resistance

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Slide 14-11

Find the Problem

- Use process of elimination
  - Substitute good parts for suspected bad parts
  - Bridge or jump out sections of a circuit
- Cool or heat a component to restore to normal operation or reveal abnormal operation
- Note changes

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Slide 14-12

Test, Troubleshoot, Debug

Ask...

- What zone(s)?
- Is it time related?
- Is it event related?
- Is it user related?
- Is it environment / weather related?

Slide 14-13

Ask...

- Have any other contractors been working in the area?
- Any recent remodels, roof leaks, etc.?
- Keep a log to show trends and patterns

Slide 14-14

Detailed & Accurate Diagnosis

- This is an absolute must!
- "It's broke" or "It doesn't work" doesn't tell you anything
- Ask; who, what, when, where & why?

Slide 14-15

Test, Troubleshoot, Debug

Swingers

Problems that are erratic or intermittent - that come and go suddenly - are almost always due to bad connections - cold solder joints or internal or external connectors that need to be cleaned and reseated

Slide 14-16

No Functions

• Problems that result in a totally dead unit or affect multiple functions are generally power supply related

Slide 14-17

Test Operation

• Read the Directions
• Walk test
• Sequence through the operation as the user would
• Check voltage, resistance, tones
• While checking resistance move wiring or vibrate components to verify firm connections

Slide 14-18

Test, Troubleshoot, Debug

Sources of Problems

- People
- Animals, insects and rodents
- Environment- heat, moisture, airflow
- Dust, dirt and contaminants
- Remodeling or movement of items
- Improper installation or application

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Slide 14-19

Sources of Problems

- Grounds, Noise -EMI, RFI, humbars, audio noise, feedback, etc.
- Wear and tear
- Shorts and Opens
- Abnormal or excessive movement of parts
- Defective equipment- mechanical faults

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Slide 14-20

Signs of Short Circuits

- Blown fuses, breakers or transformers
- Increased heat
- Low voltage
- High amperage
- Smoke or smell of smoke

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Slide 14-21

Test, Troubleshoot, Debug

Signs of Open Circuits

- Infinite resistance
- Zero Amperage
- Inoperable device

Signs of Grounds

- Abnormal voltage readings
- Abnormal amperage readings
- Abnormal resistance readings
- Shocks
- Abnormal circuit performance
- Tripped ground fault interrupters
- Blown fuses or breakers

Signs of Mechanical Faults

- Noisy operation
- Abnormal operation
- Visual clues
  - Cracks, burns, charred areas
- Smells
- Heat
- Circuit failure

Test, Troubleshoot, Debug

Programming

- Keep in mind all of the effects that programming can create in the system
- You must know your equipment - including ALL program options

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Slide 14-25

Connections

- Anything that has human intervention, either during the installation, day-to-day use or maintenance will be the MOST likely place to find problems

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Slide 14-26

Overloading

- A very common mistake made during the original design and installation
- Too many devices drawing too much current from the panel's power supply

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Slide 14-27

Test, Troubleshoot, Debug

Undersize Wiring

- Mostly a factor on;
  - Long runs (>200')
  - Data or Polling loops
  - High current devices (i.e. sirens & horns)

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Slide 14-28

Undersize Wiring

- Most manufacturers recommend a minimum of 22AWG wire for zones and 18AWG (minimum) for the transformer and siren
- Read the manufacturers instructions!

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Slide 14-29

Excessive Wire Length

- Verify wire runs over 200' with the installation instructions.
- If there is no chart in the manual - call the manufacturer
- Keep in mind, the electrons have to travel 200' out AND 200' back to the panel

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Slide 14-30

Test, Troubleshoot, Debug

Improper Installation Not installed as per Manufacturers Instructions

- Keep in mind that if you service this system without correcting the misapplication - NOW YOU ARE LIABLE

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Slide 14-31

Improper Application

- Violates U.L. listings

- Violates NFPA

- IS AGAINST THE LAW!

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Slide 14-32

Electro-Magnetic Interference

- From Lightning - can travel great distances over power lines, telephone lines or any conductor. It can even be picked up by the zone wiring. (Use twisted wire to reduce this effect.)
- From light ballast's or utility power transformers

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Slide 14-33

Test, Troubleshoot, Debug

Radio Frequency Interference

- From nearby radio towers, cellular sites, broadcast antenna's, etc..
- This is a rare problem, but not unheard of
- Typically interfering transmissions should be within the same frequency range to cause problems

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Slide 14-34

Beware of Telephone Line Options

- The addition or removal of:
  - Call waiting
  - Remote call forwarding
  - Call notes
  - DSL, VoIP
  - Any new options
- Answering machines or fax machines can also hinder downloading

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Slide 14-35

Call Waiting

- Can prevent a panel from communicating if the perpetrator dials the residence phone number prior to tripping the system if the option is not disabled. (*70)
- Can prevent the panel from communicating if this option is disabled in the panel programming and the customer later removes the option

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Slide 14-36

Test, Troubleshoot, Debug

Call Forwarding

- Will prevent you from being able to contact the panel for downloading while the customer has their phones forwarded onto another telephone number

Slide 14-37

Fax or Answering Machine

- If on the same line with the panel, should not be set to answer on the first ring
- Prevents dealer access for downloading
- Some panels will work with it so long as the device does not pick up on the first ring

Slide 14-38

Lack of Cellular Service

- Antennas and/or amplifiers may be required in rural areas with little or no cellular coverage.

Slide 14-39

Test, Troubleshoot, Debug

DSL

May require a filter in order for regular phone equipment including the control-communicator to operate

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Slide 14-40

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VoIP

- Voice Over Internet Protocol
- Can work one minute and not the next
- Verify with VoIP provider
- Verify with manufacturer of alarm panel
- Warn customers to check with you before they switch

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Slide 14-41

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Identify a Solution

- Remember what worked before
- Ask Coworkers, Supervisors
- Read the manuals
- Use manufacturer help lines, web sites
- Break down the problem into smaller parts

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Slide 14-42

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Test, Troubleshoot, Debug

Keep in Mind...

- Components seldom "just go bad". Something caused it
- Connections inside J-boxes and attics seldom go bad (depending on geographic location)
- Wire seldom goes bad….without a cause

Blocked Ventilation

- Make sure vents remain unblocked
- Check that cooling fans operate

Use Process of Elimination

- Mentally eliminate everything it couldn't be
- Don't waste time with these parts of the system unless your updated diagnosis indicates reconsideration

Test, Troubleshoot, Debug

Use Common Sense

- "Nothing works"; check: power supply, fuse, transformer or circuit breaker?
- If the key pad or other components are working…its not auxiliary power

Implement the Solution

- Make sure your solution will address the problem
  - Use common sense
  - Use your experience
  - Ask coworkers and supervisors
  - Refer to manufacturer manuals, websites and help lines
  - Observe

Verify proper operation

- Test after each fix to make sure it is really fixed
- Make sure that your fix did not break something else

Test, Troubleshoot, Debug

Make Sure That Was The Only Problem

- You may fix what you think is the problem and leave another problem uncorrected
- Test the full system before you leave

Document Problems & Actions Taken

- Record the steps you took to fix or change the system
- This avoids repeating the same steps if the problem happens again

---

Poor Troubleshooting Techniques

- "Shotgun" approach - change out components until the problem goes away
- "Curing the symptom" - not correcting what caused the problem in the first place
- Failure to replace outdated components or technology known to cause problems
- Failure to maintain system on a regular basis (i.e. battery)

Test, Troubleshoot, Debug

Problems With The "Shotgun Approach"

- Wastes precious billing time on unnecessary components
- Costs either you or the customer more in labor billings/charges
- Often it only fixes the symptom
- Doesn't look professional to the customer

S.W.A.G.

- "Silly, wild 'aggie' guess".
- Makes you as an installer/technician seem incompetent
- Reflects poorly on your company and the industry

Class Exercise

What was your most recent service call?

How did you fix it?

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Train Users

Chapter 15

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Slide 15-1

Review User Documentation
(Manuals & Instructions)

- To properly demonstrate the operation of a system you need to be an expert in how it operates
  - Read the instruction manual
  - Run through the system until you are comfortable

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Slide 15-2

Identify Training Objectives

- Decide which features to cover
- Proper training is a critical part of good customer service
- Get it right -return visits are costly
- Confirm who all the actual users are

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Slide 15-3

Train Users

Procure – Develop Training & User Aids

- Write a script based on user documentation to train a customer
- Have manuals and videos on hand

Slide 15-4

Demonstrate System Functions And Capabilities

- Repeat a pre-developed script to train a customer
- Demonstrate a system
- Compare common ways to train customers e.g. demonstration, video, written manual

Slide 15-5

Guide User Through System

- Sequence the customer though the operation of the system
- Use clear & understandable descriptions
- Let the user show you each step
- Involve the customer in the demonstration

Slide 15-6

Train Users

False Alarm Prevention

- Explain the impact of false alarms
  - Cost to police
  - Danger to responders
  - Cost of alarm fines
- Stress that anyone with a key be trained

Slide 15-7

False Alarm Prevention

- Explain how to cancel an alarm
- Describe the difference between the keypad code and the cancel code

Slide 15-8

Verify and Document

- Ask questions
- Document any problems experienced by the customer during training
- Document when each customer is trained

Slide 15-9

Train Users

Use a Video

- Available online at
  - www.faraonline,org
  - www.nesaus.org

Slide 15-10

Continue the Training

- Add bulletins in invoices or newsletters
- Offer training to new employees or users
- Give refresher training after false alarms
- Make additional manuals available if customer looses theirs.

- Use free resources available at www.faraonline.org

Slide 15-11

As Built Documentation

Reasons for Documentation

- Helps to determine actual job costs
- Helps on future service calls
- Helps to explain system to customer without a visit to the site
- Helps if there is ever a question about what was installed

Slide 16-2

User Manual & Training Materials

- Simplify the manual for the customer
- Note any changes from normal operation
- Note any special features

Slide 16-3

As Built Documentation

"As Built" Drawings

- Mark a set of floor plans or blueprints to:
  - Show the final system as installed
  - Show route of wiring
  - Location of devices
- Make a set for the site and another for the files

Slide 16-4

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Zone Diagram

- Do a diagram of what is connected to each zone
- Show the type and location of connected devices
- Make a set for the site and another for the files

Slide 16-5

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Equipment Lists

- List the type and model of installed equipment
- Make a set for the site and another for the files

Slide 16-6

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As Built Documentation

Commercial Fire Systems

The Arkansas Fire Prevention Code requires 11 documents be submitted for review and approval prior to system installation. They are:

1 – a floor plan
2 – location of alarm initiating and notification appliances
3 – alarm control and trouble signaling equipment
4 – annunciation
5 – power connections
6 – battery calculations
7 – conductor type and sizes

8 – voltage drop calculations
9 - Manufacturers, model numbers and listing information for equipment, devices and materials.
10. Details of ceiling height and construction.
11. The interface of fire safety control functions.

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Slide 16-7

Class Exercise

Tell us an example of how as built documentation helped you to install add-on equipment or do a service call

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Slide 16-8

Warranty Paperwork

- The warranty is clarified and enforceable with proper documentation that states:
  - What is covered
  - When the coverage begins and ends
  - Demonstrates that the customer accepted the system

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Slide 16-9

As Built Documentation

Change Orders

Written documentation should be signed by the customer to identify any changes from the contract, even if the changes are at no additional charge

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Class Exercise

Tell us some common reasons for change orders

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Maintenance & Repair

Chapter 17

Slide 17-1

Maintenance

A "Check-up"

Recurrent inspections, tests and corrections to keep the system and it's component parts in an operative condition at all times

Slide 17-2

Benefits of Maintenance

• Verify proper operation
• Reduce chance of system failure
• Extend the life of system components

Slide 17-3

Maintenance & Repair

Timing of Maintenance

- Standards
- Manufacturer's guidelines
- Warranty
- Customer Requirements

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Common Maintenance Tasks

- Cleaning
- Alignment
- Voltage and resistance tests
- Operation testing
- Check environment for changes that could effect operation
- Replacement of worn out parts

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Repair

- To restore by replacing a part or putting together what is torn or broken
- To fix
- To restore to a sound or healthy state

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Maintenance & Repair

Diagnose Source Of Problem

- Remember the troubleshooting steps
  - Listen
  - Observe
  - Correct
  - Verify

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Slide 17-7

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Class Exercise

Tell us about a recent maintenance call and what the condition of the system was

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Slide 17-8

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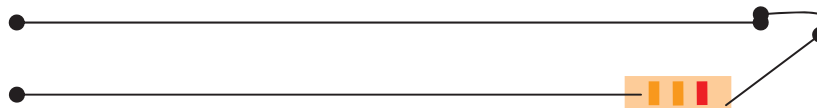
Level I Homework

Convert the following:

250 mA (milli-Amps) = _____Amps   4.7KΩ (killo-Ohms) = _____ Ω

50µA (micro-Amps) = _____Amps   3,300Ω = _____KΩ (killo-Ohms)

_____

$E_T = 12V$

$R_T = 3.3KΩ$

What is the current of the circuit above? _____A   or   _____mA

_____

What is the size (Ohms and tolerance) of a resistor with the following color bands?
Band 1 = Grey
Band 2 = Orange
Band 3 = Red
Band 4 = Silver   _____Ω ± _____%

_____

What fire (building) code has Arkansas adopted?_____

What state agency regulates alarm companies in Arkansas?_____

What type of door contact is more difficult to defeat due to a magnet built into the switch?_____

What is the minimum standby battery time that should be provided? _____hours

What regulating agencies ensures safety on a job-site?_____